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SUBSCRIPTION PRICE, PER VOLUME
OF NINE NUMBERS
AND INDEX, \$1

EXPERIMENT STATION RECORD.

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EXPERIMENT STATION RECORD.

VOL. 35.

ABSTRACT NUMBER.

NO. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

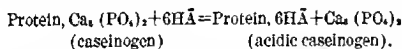
AGRICULTURAL CHEMISTRY—AGROTECHNY.

Annual reports on the progress of chemistry for 1915, edited by J. C. CAIN, A. J. GREENAWAY, and C. SMITH (*Ann. Rpts. Prog. Chem. [London]*, 12 (1915), pp. VIII+268, figs. 6).—This report deals with the progress made during the year 1915 in the subjects listed in reports previously noted (E. S. R., 35, p. 8).

The preparation and composition of caseinogen, J. MELLANEY (*Biochem. Jour.*, 9 (1915), No. 3, pp. 342-350).—The author uses the word caseinogen to denote the main protein present in milk; acidic caseinogen, the protein precipitated from milk by acid; and casein, the protein precipitated from milk by the action of proteolytic ferments and calcium salts.

A method for the precipitation of caseinogen from milk by alcohol is described in detail, together with experimental data as to the calcium and phosphorus content of caseinogen and of acidic caseinogen.

The results of the analyses of caseinogen and acidic caseinogen indicate that caseinogen is composed of a complex of one unit of protein and a molecule of tricalcium phosphate. The precipitation of acidic caseinogen from caseinogen by acetic acid is expressed by the formula



A note on iodized protein, A. OSWALD (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 85 (1915), No. 5-6, pp. 351, 352).—The author describes a procedure for the preparation of an iodized casein. This contains 14.39 per cent iodine, is pure white in color, and is not affected by the action of even the direct rays of sunlight.

A colorimetric method for the estimation of amino-acid α-nitrogen.—II. Application to the hydrolysis of proteins by pancreatic enzymes, V. J. HARDING and R. M. MACLEAN (*Jour. Biol. Chem.*, 24 (1916), No. 4, pp. 503-517, figs. 8).—The colorimetric method previously described (E. S. R., 34, p. 505) has been experimentally applied to a study of the rate of proteolysis of casein, serum albumin and globulin, peptone, nucleoprotein, gluten, fibrin, and gelatin by pancreatic enzymes. The results were compared with those obtained by the Sørensen and Van Slyke methods, and agreed very well with those from the Van Slyke but not from the Sørensen method.

The composition of "lecithin," together with observations on the distribution of phosphatids in the tissues and methods for their extraction and purification, H. MACLEAN (*Biochem. Jour.*, 9 (1915), No. 3, pp. 351-378).—Phosphatids extracted from tissues by alcohol invariably contain large amounts of a nitrogenous impurity which is very difficult to remove by any of the

ordinary methods of preparation. This material is very complex chemically and contains bodies of a purin nature. All the nitrogen of lecithin is accounted for by the cholin and amino nitrogen present.

By fractionation of the cadmium chlorid salt lecithin can be separated into two components (true lecithin and kephalin). True lecithin contains all of its nitrogen in the form of cholin, while the kephalin fraction contains only a part as cholin and the greater part as amino-ethyl alcohol.

Procedures for the extraction and purification of the phosphatids and also for the determination of cholin are discussed.

On certain constituents of the germinating maize, E. WINTERSTEIN and F. WÜNSCHE (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 5-6, pp. 349-356).—Experimental results have shown that the constituents of the germinating maize are, in many respects, different from those of the germinating wheat. The crystalline nitrogenous substances (protein cleavage products) isolated from the germinating wheat could not be found in the maize.

In the two samples examined no arginin could be isolated and only traces of glutamin. Guanidin, however, was found to be present, together with a base of unknown constitution. Hordenin (parahydroxyphenylethylamin) was also found in the maize embryo. It is possible that the amino acids carried to the maize embryo are used immediately in constructing the protein molecule, while in the wheat embryo there is a partial accumulation of these products. Whether or not the guanidin is found as an intermediate product of the protein synthesis is doubtful.

It is of interest to note that in the autolysis of the maize embryo in vitro only a small amount of protein cleavage is apparent. In the hydrolysis of the isolated proteins the usual amino acids were found. A large amount of water-soluble protein with a small amount of globulin constituted the protein found in the maize embryo. No nucleic acid could be isolated.

The fat content of the maize was found to be about four times as great as that of the wheat. The fat contained solid and liquid fatty acids, together with sitosterin and phosphatids.

A glucosid was also found, together with pentoses which were probably split from pentosans during the autolysis, and a considerable amount of inosic phosphoric acid.

The occurrence of sucrose in grapes of American origin, H. C. GORE (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 333, 334).—An examination of 66 varieties of American grapes during four successive seasons showed that 43 of them contained no sucrose, 10 contained sucrose occasionally, and in 13 varieties it was frequently present.

It is indicated that sucrose should be regarded as a normal constituent of many varieties of grapes of American origin.

The occurrence of sucrose in relatively large amounts in a new seedling grape, W. B. ALWOOD and J. R. EOFF, JR. (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 334, 335).—The authors submit analytical data of a seedling grape of unknown origin in various conditions. The data include the specific gravity, total solids, sugar-free solids, invert sugar, sucrose by inversion, total sugar as invert, and total acid as tartaric.

The acetone content of milk, N. O. ENGELDT (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 5-6, pp. 337-350).—A summary of the analytical data submitted shows the acetone content of cow's milk to vary between 1.45 and 2.42 mg. per liter, with an average of 1.85 mg. for ten determinations. The total quantity per day varied, and seemed to be in direct relation to the quantity of milk produced. The age of the animal, the stage of lactation, and

the conditions of pregnancy seemed to have no influence on the acetone content of the milk.

The quantity present in mare's milk varied between 0.48 and 0.97 mg. with an average of 0.71 mg. per liter in five determinations. In ewe's milk for five determinations the variation was found to be between 0.48 and 0.68 mg., with an average of 0.56 mg. per liter. The amount in goat's milk varied from 0.97 to 1.45 mg., with an average of 1.07 mg. per liter for six determinations. Unilateral thyroidectomy had no influence on the acetone content of the milk. In human milk the variations were found to be between 0.48 and 1.16 mg. per liter.

The procedure used by the author for the determination of the acetone was to precipitate the protein of the milk with a 10 per cent solution of tannic acid, then distill the acetone in the usual manner, and titrate with a standard iodine solution, using a finely calibrated burette.

Studies on the reducing properties of milk. J. SAMÁRKA (*Wiener Tierärzt. Monatsschr.*, 2 (1915), No. 12, pp. 545-552).—The author has repeatedly observed that if two samples of middle milk are drawn from any quarter of the udder of a healthy cow, the one in a sterile container and the other simply in a clean container, both samples will decolorize methylene blue in the same period of time. After being kept at room temperature, however, for about eight hours the sterile sample will decolorize methylene blue much sooner than the other sample. The difference in time of decolorization is considerable and not easily explained.

It is indicated that the bactericidal property of milk probably plays a rôle in the phenomenon, and that by its activity it destroys the reducing enzyme.

The analysis of waxes with special reference to beeswax and wool wax. F. W. RICHARDSON and G. A. BRACKWELL (*Jour. Soc. Chem. Indus.*, 35 (1916), no. 3, pp. 169-163).—The following average values, obtained from the analyses of three samples of beeswax, are submitted: Unsaponifiable matter—Hübl iodine value, 8.06; butyro-refractometer at 75° C., 21.3; refractive index at 75°, 1.450. Saponifiable matter—melting point, 53.5°; butyro-refractometer at 50°, 1.1; refractive index at 50°, 1.446; calculated butyro-refractometer at 75°, 5.5; Hübl iodine value, 11.9.

The average composition of wool wax obtained is given as follows: Saponifiable matter—free fatty acids, 2 per cent; neutral esters, 56 per cent. Unsaponifiable matter—42 per cent. The wax itself has the following values: Hübl iodine value, 25; acid value, 1; butyro-refractometer at 50°, 76. Fatty acids in the saponifiable matter: Hübl iodine value, from 8.5 to 10; melting point, 42°; butyro-refractometer at 50°, 45; neutralization value, from 136 to 150. The unsaponifiable matter has a refractive index of from 1.489 to 1.495, Hübl iodine value of from 40 to 50, and acetyl saponification value of 135.

The analytical procedures used in separating the saponifiable and unsaponifiable matter are outlined in detail. Other analytical methods are also described.

Researches on the nature of enzyme action.—IV. The action of insoluble enzymes. W. M. BAYLISS (*Jour. Physiol.*, 50 (1915), No. 2, pp. 85-94).—Continuing work previously noted on the nature of enzyme action (E. S. R., 31, p. 608), it has been shown that urease, lipase, emulsin, invertase, lactase, papain, peroxidase, and catalase are active in media from which they can be filtered by ordinary filter paper, while the filtrates are inactive. Suspensions of solid preparations of pepsin and trypsin in strong alcohol are decidedly more active than the filtrates of such saturated solutions. These enzymes seem to be able to assume a colloidal state in such solutions to a small degree and thus to exhibit a slight activity.

"Enzymic activity is thus manifested at the interface of contact between the solid enzym phase and the liquid substrate phase. The catalysts concerned are not in true solution."

I, The relation of hydrogen ion concentration of media to the proteolytic activity of *Bacillus subtilis*. II, Proteolysis of *Streptococcus erysipelatis* and *S. lacticus* compared under different hydrogen ion concentration, A. IRANO (*Massachusetts Sta. Bul.* 167 (1916), pp. 139-185, figs. 6).—The bacteriological value of Sørensen's method for the study of proteolysis in conjunction with variations in the hydrogen ion concentration has been determined, the organism *B. subtilis* being used in the investigation. It was shown that certain hydrogen ion concentrations measure the exact influence, both inhibitory and prohibitory, and indicate the exact limits of the proteolytic activity of the micro-organism. With increasing proteolysis the hydrogen ion concentration of the medium converges toward the optimum. The results indicate that *S. subtilis* produces endoenzym and no exoenzym. Sørensen's method yielded very satisfactory results in determining the rate of proteolysis. For obtaining any desired hydrogen ion concentration in a medium the colorimetric method was used.

The apparatus and technique employed in the investigation are described in detail. A review of the earlier literature on the subject is also included.

Part 2 deals with the application of the method developed in the investigation to a study of *S. erysipelatis* and *S. lacticus*. The virulent strain of *S. erysipelatis* was found to multiply much more rapidly in a broth medium than the nonvirulent strain, *S. lacticus*. A difference both in degree and rate of proteolysis was evident, *S. erysipelatis* being much more active and vigorous. The results indicate a very close relationship between the optimum hydrogen ion concentration for proteolysis (in the bouillon) and the hydrogen ion concentration of the natural environment of the organisms (blood and milk).

The general applicability of the paper pulp filter to quantitative analysis. S. L. JORDI and E. H. KELLOGG (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 317-319).—Experimental data submitted indicate that the application of the pulp filter to the quantitative estimation of barium and sulphuric acid as barium sulphate, of silver and hydrochloric acid as silver chloride, and of potassium and ammonium as chloroplatinate gives results as accurate as those obtained by the use of standard filter paper. See also a previous note (E. S. R., 34, p. 712).

A simple apparatus for filtration under diminished pressure, J. C. INY (in *Biochem. Jour.*, 9 (1915), No. 3, pp. 321, 322, fig. 1).—An apparatus is described in which a specially designed cylindrical tube is used instead of an ordinary suction flask for filtration under diminished pressure. The apparatus is deemed of special value when manipulating small quantities of material in that it obviates undue loss in transferring the material to another container.

Color standards and colorimetric assays, H. V. ARRY and C. H. KING (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 303-317).—The preparation of color standards for ammonia, nitrate, nitrite, vanillin, uric-acid, salicylic-acid, and phosphate colorimetric procedures is described in detail. The solutions used for making standard blends are divided into three series, viz, cobalt-thio-copper, cobalt-chromium-copper, and chromium-manganate.

Some indicators from animal tissues, W. J. CROZIER (*Jour. Biol. Chem.*, 24 (1916), No. 4, pp. 443-445).—The preparation and color changes of indicators prepared from *Ascidia atra*, *Ptychodora* sp., *Chromodoris zebra*, and *Eupolythmus aurantiaca* (?) are reported.

The influence of fluorspar on the solubility of basic slag in citric acid. G. S. ROBERTSON (*Jour. Soc. Chem. Indus.*, 35 (1916), No. 4, pp. 216, 217).—Experimental data submitted indicate that the citric-acid test gives no true

index of the phosphate present in fluorspar slugs and affords no guide as to the value of the slag. The phosphatic slag obtained by the use of fluorspar in the manufacture of steel by the open-hearth process has a low citric-acid solubility. The phosphate is, however, completely soluble if the extraction be prolonged for a sufficient time. The phosphates in the slag do not appear to be in combination with silica, but seem to bear a close resemblance to those contained in mineral phosphates.

Improved methods for fat analysis, E. B. HOLLAND, J. C. REED, and J. P. BROCKLEY (*Massachusetts Sta. Bul. 166 (1915), pp. 91-133, figs. 4*).—This bulletin outlines the methods for determining the various chemical constants of oils, fats, and waxes. The methods have been carefully studied and many improvements both in the apparatus and technique introduced. Tabulated data and supplementary notes of value in the interpretation of analytical results, together with formulas for calculating certain other constants, are included.

A new procedure for the determination of the acetyl number is described as follows: Into a 300 cc. Erlenmeyer flask are brought 5 gm. of fat together with 10 cc. of acetic anhydrid. The flask is connected with a spiral or other form of reflux condenser and heated in a boiling water bath for from 1 to 1.5 hours. After acetylating, the condenser is removed from the flask and sufficient ceresine added to form a solid disk with the fat when chilled in cold water. With the flask still in the water bath 150 cc. of boiling water is added, with as little disturbance of the fat layer as possible. The flask is then removed and the contents rotated vigorously to dissolve occluded acetic acid. The ceresine fat is then solidified by immersing the flask in cold water, after which the solution is decanted through a dense filter, care being taken not to break the insoluble cake. Another 150 cc. of boiling water is added, thoroughly agitated, heated a few minutes in the bath, cooled, and decanted. The process is repeated until the final filtrate gives a decided color with two or three drops of tenth-normal alkali, using phenolphthalein as indicator. The filter and inverted flask containing the cake of ceresine fat are allowed to drain in a cool place until practically dry. The small particles adhering to the filter are then scraped into the flask, the inner portion of the filter paper extracted in a small beaker with three successive 20 cc. portions of boiling alcohol, and poured into the flask. Fifty cc. of alcoholic potash and several glass beads are then added, the flask is connected with a suitable form of reflux condenser, and the solution boiled on the water bath until saponification is complete. After cooling the solution to 60° C. it is titrated with half-normal hydrochloric acid, using 1 cc. of phenolphthalein or cotton blue, as indicator. The alcoholic mixture is again brought to boil to free any alkali occluded in the ceresine, and refiltered if necessary. Several blank determinations should be run with every series of tests, under precisely similar conditions as to time and treatment except that the ceresine may be omitted. Every lot of ceresine, however, must be tested and be free from soluble matter and not assimilate any alkali on saponification. The difference between the titration of the blanks and that of the excess alkali in the test is the acid equivalent of the fat after acetylation, which is calculated to milligrams of potassium hydroxid per gram of fat.

For the determination of unsaponifiable matter the following modified procedure is described: Five gm. of fat are completely saponified in a 300 cc. Erlenmeyer flask with 75 cc. of alcoholic potash and 25 cc. of alcohol under reflux condenser. The solution is then transferred to a 250 cc. Griffin beaker and the flask rinsed several times with hot alcohol. The alcohol is evaporated

in a water bath at a gradually increasing temperature. Several 25 cc. portions of methyl alcohol are added and evaporated to insure dryness. The dry residue is then pulverized in a mortar with 25 gm. of anhydrous potassium carbonate, dried 2 hours at 100°, transferred to an S. & S. extraction thimble, extracted from 2 to 3 hours with anhydrous ether in a continuous extractor, and the ether distilled off as usual. Any trace of moisture absorbed during the process will contaminate the ether extract with a small amount of water-soluble compounds. To eliminate this error the air-dried extract is washed with several 25 cc. portions of water at room temperature, decanted on an ether-extracted filter which is air-dried, and extracted with ether, using the same flask as before. The purified extract is dried from 1 to 1.5 hours in an oven at 100° and considered as unsaponifiable matter. This procedure is not applicable for volatile hydrocarbons or ethereal oils.

The use of enzymes and special yeasts in carbohydrate analysis, W. A. DAVIS (*Jour. Soc. Chem. Indus.*, 35 (1916), No. 4, pp. 201-210, fig. 1).—Methods for the determination of succharose, raffinose, maltose, and starch in plants and their products by means of enzymes are described in detail. On account of the specificity of the enzyme action it is indicated that such methods are of especial value in estimating the individual constituents of a complex mixture of carbohydrates.

On the determination of reducing sugars in the presence of an excess of sucrose, L. MAQUENNE (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 6, pp. 207-213).—The influence of large amounts of sucrose on the determination of reducing sugars has been studied in some detail and the results of the investigation reported.

The temperature at which the reduction takes place and also the time of heating exercises a marked influence on the results for the reducing sugars. Heating for 10 minutes at 65° C. is recommended as yielding the best results. The quantity of sample used in the analysis is also important. For materials poor in invert sugar 20 gm. samples are recommended.

The hyposulphite titration has been slightly modified and used with excellent results, especially for very small amounts of copper. The procedure, however, is not applicable in the analysis of molasses and similar materials which contain substances that absorb iodine. For such material the copper oxid must be determined either gravimetrically or by some other volumetric procedure.

An apparatus for digesting crude fiber, J. M. PICKEL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 366, 367, figs. 2).—A simple form of condenser for use in crude fiber determinations which is easy to manipulate is described in detail. The form and construction of the condenser obviates the use of all rubber connections. It can be made of zinc, copper, or even glass. In the latter case an ordinary glass flask provided with a suitable side tube in its neck is quite satisfactory.

A furnace for crude fiber incineration, J. M. PICKEL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 367, fig. 1).—An inexpensive and easily constructed furnace for use in crude fiber determinations is described in detail. It consists of a piece of asbestos board with a circular opening upon which is set a disk of wrought iron. An asbestos cylinder, specially prepared, is placed around the iron disk and is covered with a piece of asbestos board of the same dimensions as that of the base, having a small hole in its center. The heat is supplied by a small Bunsen burner.

The analysis of maple products.—VII. The electrical conductivity test for purity of maple sirup, J. F. SNELL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 331-333).—Revised directions for the conductivity test of maple sirup previously noted (*E. S. R.*, 31, p. 610) are submitted.

Genuine sirups have shown conductivity values as low as 96 and as high as 230. The limits of percentage variation of the conductivity value in genuine sirups are much narrower than those of any of the older analytical values, but not so narrow as those of the volumetric lead number. Additional analytical data on nonmaple sirups are reported.

A comparison of methods for the determination of casein in milk, C. B. BRASSEY (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 335, 336).—Although the official nitrogen method is the standard of accuracy for the determination of casein in milk, the analytical results obtained show that the Hart method (E. S. R., 19, p. 707) with electric centrifuge is dependable, checking very closely the official method. It is deemed far superior to the volumetric method of Van Slyke and Bosworth (E. S. R., 22, p. 112).

The Hart method possesses the advantages of requiring only a very little time and neither exactly standard solutions nor final calculation of results.

The occurrence and determination of creatin in the urine, F. H. McCREDDEN and C. S. SARGENT (*Jour. Biol. Chem.*, 24 (1916), No. 4, pp. 423-429).—Experimental data submitted indicate that "human urine contains a substance or substances other than creatin which can give a color reaction similar to that of creatinin on boiling with picric acid, and which, therefore, may appear in the results as creatin."

The reduction of As_5 to As_3 by cuprous chlorid and the determination of arsenic by distillation as arsenic trichlorid, R. C. ROARK and C. C. McDONNELL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 327-331, fig. 1).—Experimental data indicate that ferrous salts effect only an incomplete reduction of As_5 to As_3 in hydrochloric-acid solutions. Satisfactory results can be obtained only under certain conditions, usually with the presence of a small amount of copper which forms cuprous chlorid, or when only very small amounts of arsenic are present. Cuprous chlorid effectively reduces the arsenic in hydrochloric-acid solution and completely separates the arsenic trichlorid from antimony, lead, copper, zinc, iron, and calcium.

The method described consists of distilling a sample of the insecticide or fungicide in a hydrochloric-acid solution with cuprous chlorid and, after neutralization of the distillate, titrating the arsenic with standard iodine solution.

New methods for the analysis of lime-sulphur solutions.—II, The estimation of "polysulphur," R. M. CHAPIN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 339-341).—In continuation of the work previously noted (E. S. R., 34, p. 806), the author has developed a new method for the estimation of polysulphur which is claimed to be both accurate and convenient.

The method, briefly outlined, consists of adding 10 cc. of a dilution of the sample to 10 cc. of a recently prepared 10 per cent solution of C. P. anhydrous sodium sulphite and 20 cc. of fifth-normal ammoniacal zinc chlorid contained in a 200 cc. Erlenmeyer flask. Twenty-five cc. of water is added and the mixture placed on the stem bath. At intervals of 10 minutes the contents of the flask are agitated and the material adhering to the sides of the flask rinsed down with a little hot water from a wash bottle. After heating for 45 minutes, with four intermediate mixings, the flask is removed from the water bath and 20 cc. of a 10 per cent solution of crystallized strontium chlorid added. The mixture is allowed to settle for 5 minutes and filtered into a 250 cc. volumetric flask and the precipitate washed with hot water. The clear liquid is then cooled to room temperature and from 0.5 to 1 cc. of a 10 per cent solution of crystallized disodium phosphate added, made to the mark, well shaken, and filtered through a dry paper into a dry flask, the first portions being used to thoroughly wet the paper, and the runnings discarded. To 200 cc. of this clear filtrate methyl red is added and then, slowly, with thorough mixing, a 10 per cent solution of

tartaric acid to a permanent slight acid reaction. Starch is now added, and the liquid titrated with tenth-normal iodine.

From the titration figures obtained from this procedure and those previously described the various forms of sulphur existing in the dilute lime-sulphur solution can be calculated by formulas which are submitted. Suggestions on the execution of the proposed method are discussed in detail.

It is concluded that "the use of a single standard solution which can be so easily and accurately prepared and used as tenth-normal iodine means a possibility of increased accuracy, as well as a saving of time, over the gravimetric estimation of sulphur as barium sulphate under conditions which demand the employment of an empirical factor."

Phenolic insecticides and fungicides, G. I. GRAY (*California Sta. Bul.* 265 (1916), pp. 327-381, figs. 9).—This bulletin is divided into three parts.

Part 1 gives a general discussion of phenolic insecticides and fungicides and a classification, description, and data as to the properties of materials found on the market, both of refined phenols and compounded remedies. It is indicated that all the cresols are more active fungicides than phenol. Commercial cresol is usually a mixture of the three cresols. The term crude cresylic acid is deemed more appropriate to be applied to the material commonly sold as crude carbolic acid.

Part 2 gives the classification and tabulation of the results of analyses of samples taken during the fiscal years 1911-12 and 1912-13, and comments. Although many products were found to be below guaranty, manufacturers and dealers are not accused of willfully making or selling low-grade or non-standard products. It appears, however, that material has often been guaranteed and sold with but little knowledge of its composition.

Part 3 gives methods of examination and descriptions of apparatus, including a steam distillation battery, a mechanical shaker, and a small device for holding flasks in a water bath. Qualitative methods most frequently used are described and references to methods for the complete examination of the material used by the U. S. Department of Agriculture are included.

Progress in peanut milling, T. B. REESE (*Texas Sta. Circ.* 12, n. ser. (1916), pp. 3-6).—This circular describes in detail the methods commonly used in peanut milling. It is indicated that the cost of milling peanuts at the present time is greater than that of milling cotton seed. The cost of a ton of farmer's stock, which includes from 200 to 300 lbs. of waste, is about \$55. The products from this material, viz, about 65 gal. of oil and about 1,200 lbs. of cake will yield the miller about \$64, or a margin of \$9.

Some chemical changes in the resweating of seed-leaf tobacco, H. R. KAUFMANN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 4, pp. 336-339).—The investigation is summarized as follows:

"The greatest loss of dry matter during the resweating process occurs in the proteins, nicotine, ether extract, and nitrogen-free extract. The total nitrogen, ammonia, nitric acid, and crude fiber show slight losses. The amides and reducing substances show an increase. The changes during the resweat are quite similar to those of the first sweating process. It seems, therefore, that the resweat is a continuation of the first sweating process. . . .

"The total loss in nitrogen is 0.61 per cent. The difference between the total loss of nitrogen and the loss of nitrogen as nitric acid, ammonia, and amides (loss of protein nitrogen minus amid gain in nitrogen) is 0.28 per cent. It appears from this that most of the nicotine which is lost is lost by volatilization. This is in accord with the results of Garner [*E. S. R.*, 20, p. 936].

"It is evident that a breaking down of proteins into amides occurs. From this we can readily see that there is probably an enzyme present which is

capable of breaking down the proteins. Since the increase in amid nitrogen is not so great as the loss in protein nitrogen it suggests that there may be present a ferment which breaks up the amino acids, although no definite conclusions can be drawn."

METEOROLOGY—WATER.

Report of the meteorological station at Berkeley, California, for the year ending June 30, 1914, W. G. REED (*Univ. Cal. Publ., Geogr., 1 (1916), No. 9, pp. 373-439, pls. 12, figs. 9*).—The instrumental installation and the character and methods of observations made are briefly described, and observations on temperature, pressure, precipitation, atmospheric moisture, frost, and wind are reported. A summary of the results of a hydrographic survey (rainfall and run-off) of Strawberry Creek, near the university, is also included.

The mean annual temperature for the year was 58° F. The extreme range of temperature was about 70°. September was the warmest month and December the coldest. The maximum temperature, 105.5°, occurred September 16, 1913; the minimum, 36°, was recorded December 15, 1913, and January 9, 1914. Frost occurred from November to March. The relative humidity averaged 86 per cent morning and night, and the mean dew point was about 44° in winter and 54° in summer. Nearly 40 per cent of the days were generally clear. Fog was observed on 29 days. The total precipitation was 33.53 in. or 7.12 in. more than the average.

Meteorological observations, J. S. STEVENS (*Maine Sta. Bul. 245 (1915), pp. 369-319*).—A monthly and annual summary of observations at the University of Maine on temperature, precipitation, cloudiness, and wind movement during 1915 is given. The mean temperature for the year was 46.21° F., as compared with an average of 42.73° for 47 years; the total precipitation was 38.87 in., as compared with mean annual precipitation of 42.67 in. for 47 years; the snow-fall was 49.1 in., as compared with 87.34 in. as the average of 47 years; the number of clear days was 177; the number of cloudy days, 121; and the total movement of wind was 48,224 miles.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and D. POTTER (*Massachusetts Sta. Met. Buls. 327, 328 (1916), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1916, are presented. The data are briefly discussed in general notes on the weather of each month.

Weather summaries, L. R. WALDRON (*North Dakota Sta., Rpts. Dickinson Substa., 1911, pp. 13, 14; 1912, pp. 16, 17; 1913, pp. 37-39*).—Observations at Dickinson, N. Dak., during 1911, 1912, and 1913 on temperature and rainfall are summarized by months and compared with the normals. Data relating to early and late frosts are also given.

Climatic conditions of Minnesota, U. G. PURSELL (*Univ. Minn., Geol. Survey Bul. 12 (1915), pp. 16-29, figs. 12*).—The geographic and physiographic features which affect the climate of the State are briefly described.

The climate is continental, modified to a considerable extent by numerous inland bodies of water. The State "is in the path of a large proportion of the low-pressure areas which move across the United States from west to east. These areas move at an average speed of 600 miles in 24 hours and are preceded by southerly winds and higher temperature and followed by northerly winds and lower temperature. They are usually accompanied by cloudy weather and precipitation, each storm causing an average of from one to two rainy days as it crosses the State. As there is an average of almost two of these storms each

week, with fair-weather periods between, it follows that the changes in weather conditions are rather rapid. One or two days of stormy weather preceded by fair weather and followed by clearing and lower temperature, to be repeated in turn, make up the usual routine for the week. However, Minnesota is so far from the coast that damaging ocean storms lose much of their severity before reaching its borders. The northwestern cold waves pass across the State . . . yet they are frequently not so severe as they are in some of the plains States in the same latitude or even farther south."

The average annual temperature for the period 1895-1913 was 41.7° F. The coldest month was January, with a mean temperature of 10.5°, the mean for February being only 0.7° higher. The warmest month was July, with a mean temperature of 69.1°. "Although frosts have occurred in some portions of the State every month of the year, damaging temperatures are not to be expected during June, July, and August, and they are comparatively rare in the last half of May and the first half of September." The longest frostless season, 100 days, "obtains along the Mississippi River from Hennepin County to the southeastern corner of the State, and the shortest, 100 days or less, is in the region of the Mesabi and Vermilion Iron ranges." The influence of Lake Superior in lengthening the crop season is plainly observed.

The average annual precipitation for the 18 years 1896-1913 was 27.72 in., and the average for the crop season, April to September, 1895-1913, was 29.16 in. June was the wettest month, with 4.18 in., and July next, with 3.79 in. The lowest average monthly rainfall was that of February, 0.66 in. "The precipitation is about one-fourth to one-third greater along the eastern boundary of the State than along the western boundary." The annual snowfall averaged from 24 to 54 in., being "lightest in the southwest portion of the State and heaviest on the Mesabi Iron Range." The prevailing direction of winds was northwest. The sunshine averaged from 43 to 53 per cent of the amount possible. The rainy days varied from 64 at Lynd to 132 at Duluth.

Climate and meteorology [of New Zealand], D. C. BATES (*New Zeal. Off. Yearbook 1915*, pp. 72-94, figs. 6).—The principal characteristics of the weather and climate of New Zealand, based upon observations at various places in the country during 1914 and previous years, are fully set forth in tables, charts, and descriptive notes.

Climatic changes in historic and prehistoric times, O. PETTERSSON (*K. Svenska Vetensk. Akad. Handl.*, 51 (1913), No. 2, pp. 81, pls. 2, figs. 22).—The scientific evidence on this subject is discussed in considerable detail.

Periodicity in sunspot phenomena and its relation to climatic changes, O. PETTERSSON (*K. Svenska Vetensk. Akad. Handl.*, 58 (1914), No. 1, pp. 64 pl. 1, figs. 21).—The scientific evidence on this subject is discussed in considerable detail.

The drying up of the earth, C. KASSNER (*Atti Cong. Internaz. Geogr.*, 10 (1913), pp. 964, 965; *Met. Ztschr.*, 32 (1915), No. 7, pp. 332, 333).—Reviewing the various kinds of evidences bearing on this subject, the author concludes in general that while the earth as a whole is not drying up the land areas may be.

A new sampling apparatus for the determination of aerial dust, G. T. PALMER (*Amer. Jour. Pub. Health*, 6 (1916), No. 1, pp. 54, 55, fig. 1; *abs. in Chem. Abs.*, 10 (1916), No. 8, p. 1067).—An apparatus with which it is possible to wash the dust from large volumes of air rapidly is described.

SOILS—FERTILIZERS.

A detailed study of effects of climate on important properties of soils, C. B. LIPMAN and D. D. WAYNICK (*Soil Sci.*, 1 (1916), No. 1, pp. 5-48, pls. 5, fig. 1).—Investigations at the University of California on the more important

physical, chemical, and bacteriological characteristics of a silt loam soil from California, a dark heavy loam soil from Kansas, and a light yellow clay soil from Maryland are reported. The purpose was to study at Maryland, at Kansas, and at California four soil blocks, as follows: (1) Natural field soil undisturbed, (2) natural field soil disturbed and replaced, (3) and (4) soil blocks obtained, respectively, from each of the other two stations, "obtaining, as nearly as possible, a complete picture of the changes occurring in a soil when it is removed from one station to another with different climatic conditions."

It was found that "soils change markedly in color in a period of seven years, and perhaps less, when moved to other climates. Kansas and Maryland soils at California become more deeply reddish in color; California and Kansas soils become bleached to a light gray or yellowish gray at Maryland. The differences are so great that samples of any one original soil from the three different stations to-day show no outward resemblance among themselves, but appear to represent three very distinct soil types.

"In general, the hygroscopic coefficient, the moisture equivalent, and the wilting point of any of the soils increase when the soil is placed at California. Some exceptions to this rule are noted.

"In general, bacterial numbers increase in arid soils placed under humid conditions. In general, also, the opposite is true for humid soils. The Maryland soil offers an exception to the latter rule. Ammonification, nitrification, and nitrogen fixation follow the general trend of bacterial counts. The general trend, however, applies in the case of nitrification to certain forms of nitrogen only. . . . Cellulose destruction by soils proceeds with greater rapidity under arid than under humid conditions with any given soil type . . . [and], therefore, appears to follow in general the opposite course of other micro-organic activity in soils as affected by climate.

"Marked changes in the acid-soluble constituents of soils are wrought by climatic effects. . . . Soils may often obtain accretions of the different constituents when removed from one climatic environment to another. California soil increases in lime at Kansas and Maryland, particularly at the latter station, and loses in iron. The general tendency is for soils to increase in iron and decrease in alumina when placed under arid conditions, and vice versa. Phenomenal losses in certain constituents in five years seems to have occurred in some soils even when the latter were not moved. The Maryland soil loses in the period named enormous quantities of magnesia. . . . Large increases occur [in the total water-soluble constituents] in the California soil when it is moved to the Kansas or Maryland stations. On the other hand, the Maryland soil gains in water-soluble matter when moved to Kansas or to California."

A list of eight references to literature bearing on the subject is given.

Contribution to the study of clay, A. MUNTZ and H. GAUDECHON (*Vie Agr. et Rurale*, 5 (1915), No. 21, pp. 380-384, fig. 1).—Studies on clay suspensions of one type of three concentrations in which each suspension was broken by siphoning into four fractions after 48 hours are reported.

It was found that the amount of deposition of suspended clay increased with the concentration of the suspension. The difference between fractions increased as the concentration decreased. The clay suspension disappeared most rapidly in the top fraction of smallest concentration. Temperature had little influence on deposition. Studies of the successive fractions over periods varying from 1 to 144 hours showed that the speed of deposition expressed in arbitrary units varied from 100 in the first hour to 1 in the 144th hour.

Further studies with a single clay and with four different clays to determine the influence of gravity and of an electrical field on deposition yielded results similar to those obtained in previous work (E. S. R., 30, p. 422).

Effect of grinding on the lime requirement of soils, R. C. COOK (*Soil Sci.*, 1 (1916), No. 1, pp. 95-98).—Experiments conducted at Rutgers College on six different soils are reported, the results of which are taken to indicate that "soils should not be ground if used for determination of lime requirement by the Veltch method. Grinding sandy soils of New Jersey increases their acidity instead of decreasing it, according to the method employed."

Albuminous bases formed from organic matter of soils by hydrolysis, A. SHMUK (*Zhur. Opytn. Agron.*, 16 (1915), No. 4, pp. 281-298; *abs. in Chem. Abs.*, 10 (1916), No. 2, p. 243).—By long enough boiling of soil or humic acid with 25 per cent sulphuric acid the author succeeded in isolating and identifying two compounds which he classed as amino acids. Arginin and lysin were found in compounds obtained from three different chernozem soils.

[Soil moisture studies] (*North Dakota Sta., Rpt. Dickinson, Subata.*, 1915, pp. 31-36, figs. 4).—Studies on four loam soil wheat plats (A) continuously cropped, spring plowed, (B) continuously cropped, fall plowed, and (C and D) alternately cropped and summer fallowed showed an increase in moisture in all the plats between October and April and a decrease during the remainder of the season. The spring-plowed plat showed considerably less moisture than the fall-plowed plat. Plats C and D showed about the same amounts of water available to the crop until the crop began to draw heavily on the available water, after which the plat recently fallowed lost but little water, while the upper 3 ft. of the other plat became as dry as plats continuously cropped. In the lower 3 ft. of the fall-plowed plat and Plats C and D there was an increase in the amount of growth water from the fall until the following spring. In the spring-plowed plat there was a decrease. The water available to crops was used most economically on the spring-plowed plats.

Similar data for barley plats are also reported, but are apparently deemed unsatisfactory.

Soil gases, J. W. LEATHER (*Mcm. Dept. Agr. India, Chem. Ser.*, 4 (1915), No. 3, pp. 81-134, figs. 4).—An apparatus for the abstraction of soil gases from undisturbed soil samples and a method of estimation of the argon content of the soil are described, and results of studies of Pusa and other Indian soils are reported. The object was to obtain more definite information regarding the gases present during the decomposition of green manure, the gases of swamp rice soil, the assimilation of nitrogen by Papilionaceae, the gases present near the roots of crops, and changes during nitrification.

It was found that the volume of gas in soils determined by direct measurement is approximately equal to that determined by indirect calculation. The volume of condensed gas in Pusa soil was too small to be estimated accurately and is thought to be not greater than 4 per cent of the gas present. The volumes of gas were smaller in wet weather than when the soil was dry. "The volume of displaced gas is not necessarily equal to the additional water, and the experimental results also show that one volume of water does not necessarily displace one volume of gas. At the same time the two approach equality.

"The whole of the gas is not displaced from a soil; even during the wettest weather the proportionate volume of gas only falls to 15 or 20 per cent, or about one-half the volume which is present during long periods of hot, dry weather.

"The soil gas of land which has been freshly treated with farm manure or green manure naturally contains a high proportion of carbon dioxide and a low proportion of oxygen, but it is evident from the information gained by operating with closed vessels (containing abundance of air) that were it not

for the process of diffusion, the proportions would be very different from what they are."

High proportions of carbon dioxide and frequently low proportions of oxygen were found in the neighborhood of the roots of such crops as hemp, indigo, and maize, together with small but definite quantities of hydrogen. "Although high proportions of carbon dioxide are frequently present in the gas as extracted from the soil, calculation shows that considerably the greater part is present in the dissolved state in the soil solution."

Determination of the ratios of oxygen and nitrogen to argon in the soil gases showed "that the chief changes in the soil have to do with the oxygen, whilst nitrogen-assimilation or nitrogen-evolution in dry land is at least so limited that it is usually difficult to detect. . . . In cases like the gas from rice land, the argon determination demonstrates with certainty that most of the nitrogen is derived from the soil and manure. . . ."

"It is certain that diffusion of gases through soils at a depth of from 12 to 15 in. is so efficient as to warrant the conclusion that cultivation of the surface soil is unnecessary for purposes of aeration. The well-established value of good cultivation must be referred to other causes."

Agronomic and soil conditions in the Selby smoke zone. C. F. SHAW and E. E. FREE (*U. S. Dept. Int., Bur. Mines Bul. 98 (1915), pp. 451-462*).—An investigation of the agronomic and soil conditions of the Selby smoke zone in Solano County, Cal., to determine the extent to which the vegetation is injured and the soil polluted by smelter fumes and dust in that district, is reported.

The opinion is expressed that while crop yields in the region are below what would be expected for such a climate, they may be attributed more to poor soil and poor agricultural practice than to some definite unfavorable factor such as smelter dust and fumes. With reference to soil pollution, it is concluded that "arsenic is certainly a normal, though extremely minute, constituent of the soils of the region, and lead is probably so. The past contamination of the soils by lead and arsenic from the smelter is possible but unproved and appears not to be susceptible of proof. The quantities of lead and arsenic added, if any, have been small and of the same order as the quantities of these elements normally present in the soils. The maximum amounts of lead and arsenic found are far too small to have any injurious effect on plants grown in the soils. Much larger amounts than those actually found would be without practical effect on the agriculture of the region."

Data regarding soil samples are included.

Mississippi: Its geology, geography, soils, and mineral resources. E. N. LOWE (*Miss. Geol. Survey Bul. 12 (1915), pp. 335, pl. 1, figs. 28*).—This is a popular report covering the geology, geography, mineral resources, underground waters, and soils of the State of Mississippi. The section on soils has been taken mainly from a previous report (*E. S. R., 26, p. 811*).

Soil survey of Johnson County, Missouri. B. W. THILMAN and C. E. DEARHOF (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the Missouri Experiment Station and issued May 5, 1916, deals with the soils of an area of 531,840 acres in western Missouri, lying in the residual prairie section of the Great Plains region. The topography is rather more rolling than undulating and level. The county is well drained. The soils are classed as upland soils of residual origin, which cover about 85 per cent of the area, and lowland soils of alluvial origin. Sixteen soil types of 10 series are mapped, of which the

Summit, Boone, Osage, and Bates silt loams cover, respectively, 27.5, 26.9, 12.2, and 11.1 per cent of the area.

The soils of Antigua, H. A. TEMPANY (*West Indian Bul.*, 15 (1915), No. 2, pp. 69-102, pls. 8).—This report deals primarily with the physical and chemical characteristics of the soils of an island area of 108 square miles, which topographically is divided into three principal regions: (1) A generally flat central plain, which traverses the island diagonally from west to east; (2) a northeastern limestone area consisting of undulating country; and (3) a mountainous southwestern area of volcanic origin.

The soils of the limestone area approximate very closely to a single physical type in which the particles of the fine silt and clay on the average constitute 65.9 per cent of the soil. "The soils of the low-lying central portion of the island . . . comprise a series of heavy clay soils deficient in calcium carbonate, requiring thorough tillage and drainage for the maintenance of tilth." The soils of the southern district are noncalcareous and well drained, and "approximate fairly closely to one physical type in which the larger and the smaller particles are nearly balanced."

Tables showing the mean physical composition of the principal soil types encountered on the island are appended.

Studies on soil protozoa, S. A. WAKSMAN (*Soil Sci.*, 1 (1916), No. 2, pp. 135-152).—Studies with loam soils of high and low humus content and clay soils on (1) the activity of protozoa in the soil, (2) the numbers and types of protozoa in different soils at different depths, and (3) the effect of protozoa on bacterial numbers and their decomposition of organic matter in the soil are reported.

It was found that moisture, humus content, and the structure of the soil were the important factors governing the activities of the protozoa. Sterilization of soil and the addition of easily soluble organic matter made the conditions optimum for protozoan activities at a lower moisture content than the corresponding unsterilized or untreated soils. The flagellates were the most common soil protozoa found active in the soil with moisture content too low for the development of the other groups.

"The flagellates are the largest group of soil protozoa; the greatest number of flagellates are found in the soil just below the surface; the ciliates at a depth of 4 in.; the numbers decrease with the depth, so that below 12 in. the soil is practically free from protozoa. Soil protozoa do not have any appreciable influence upon the ammonification by bacteria. The presence of protozoa acts detrimentally upon bacterial numbers, so that when the conditions become favorable for protozoa development, the bacterial numbers decrease."

The spirit of the soil, G. D. KNOX (*London: Constable & Co., Ltd.*, 1915, pp. XIII+242, pls. 16).—This book gives a popular account of nitrogen fixation in the soil by bacteria and of the production of auxinones in bacterized peat according to Bottomley. It contains chapters on the nitrate problem; England's food supply in peace and war; bacteria and protozoa; peat and its uses; fixation of nitrogen by leguminous plants; humus; bacterized peat, its preparation and general properties; vitamins, accessory food bodies, and auxinones; elementary conceptions of chemistry in relation to the soil; the testing of humogen; the preparation of humogen; and how humogen is applied. Two final sections give the results of experience along the above lines.

It is the main contention of this book "that soil inoculation scientifically carried out will greatly increase the yield of the land that is already under cultivation, and that it will bring into cultivation large tracts of land that it has hitherto not paid to cultivate, and that by the stimulation of plants it will

be possible to bring fruit and flowers to maturity earlier than can be done by other means."

Considerable space is devoted to the newly discovered accessory food bodies or auxinones in bacterized peat. A number of different experiments are reported, the results of which are taken to indicate "conclusively that bacterized peat contains a substance or substances which stimulate the growth of the plant and enable it to utilize the normal food constituents supplied to it. In nature the need is doubtless supplied by the decaying organic matter in the soil."

Bacterial activities and crop production, P. E. BROWN (*Iowa Sta. Research Bul.* 25 (1915), pp. 359-388).—The substance of this bulletin has been previously noted from another source (*E. S. R.*, 34, p. 619).

The reclamation of bog land (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 16 (1916), No. 2, pp. 229-236, pls. 10).—A number of pot and field experiments conducted for three years with different common crops on Irish bogs are reported, the results of which are taken to indicate that lime is the limiting factor in the reclamation of Irish bogs while phosphate is next in importance.

"Notwithstanding the large amount of nitrogen in the peat, the necessity of supplying this ingredient in a form in which the plant can use it was clearly demonstrated. . . . As long as the different crops were producing leaf and stem only, potash was the least important of the four ingredients, but its influence was most marked in filling the grain and stiffening the straw in the case of the rye and of increasing the yield of tubers in the case of the potato."

An experiment with marls and shell sands as substitutes for lime on these soils showed that most of the marls and shells tested were as good as burned lime.

Analysis of plants and soils to determine the amounts of nutritive substances in soils, T. FEMMER, E. BLANCK, W. SIMMERMACHER, and W. RATHMANN (*Landw. Vers. Stat.*, 86 (1915), No. 5-6, pp. 339-391; *abs. in Chem. Zentrbl.*, 1915, II, No. 5, pp. 239, 240; *Ztschr. Angew. Chem.*, 28 (1915), No. 85, Referatentz., p. 421; *Jour. Chem. Soc. [London]*, 103 (1915), No. 634, I, p. 763, 764; *Jour. Soc. Chem. Indust.*, 34 (1915), No. 18, p. 972).—Pot and laboratory experiments with seven different soils to determine the usefulness of plant and soil analysis in estimating the fertilizer needs of soils are reported, being based in part on the results of previous work (*E. S. R.*, 29, p. 514).

The conclusion is drawn that in establishing uniformity in the available water content of different soils, the content of hygroscopic water represents the water content at which plant growth starts only in so far as with increasing hygroscopicity of the soils a corresponding water addition is necessary. On this basis, crop substances were obtained on different soils which showed only a slight variation in the content of the nutritive constituent present in minimum, or the so-called normal content. This is taken to indicate that the physical properties of soil are not of great importance in plant production in so far as they do not influence the factor water. It is concluded further that the so-called normal content of any nutritive constituent does not offer a sufficient comparative basis on which to interpret plant analysis in terms of fertilizer needs of the soil.

It was further found that the amount of nitrogen taken up by plants from an unmanured soil was only slightly increased by manuring with an excess of phosphoric acid and potassium. Assimilation of phosphoric acid, on the other hand, was much more influenced by application of nitrogen and potassium, partly owing to greater root development and partly to increased solubility of the soil phosphates, which varied with different soils. The same held good in the case of potassium.

Oat plants assimilated only about 10 per cent of the phosphoric acid dissolved by 1 per cent hydrochloric acid, while with potassium the results agreed much more closely. Water saturated with carbon dioxide dissolved much less phosphoric acid than was assimilated by oats in the same soil. In this case the difference is attributed to the presence of organic acids in the roots, to the dissolving action of manorial salts, and to disturbances in the equilibrium of the soil solution. It is thought that the potassium fixed by absorption in soils, as estimated by Kellner, can not be the only source of potassium available to plants. While it was found that neither analysis of plants nor soil analysis, as employed, is suitable for establishing the amounts of nutrients in soils, it is considered likely that useful indications will be obtained by ascertaining the maximum amounts of nutritive substance which give increased yields.

Carbon and nitrogen changes in the soil variously treated: Soil treated with lime, ammonium sulphate, and sodium nitrate, R. S. PORRER and R. S. SNYDER (*Soil Sci.* 1 (1916), No. 1, pp. 76-94, pl. 1, figs. 2).—The work of others bearing on the subject is briefly reviewed, and pot experiments conducted at the Iowa Experiment Station to determine the influence of additions per acre of 3 tons of calcium carbonate, 1,285 lbs. of sodium nitrate, 1,000 lbs. of ammonium sulphate, and of combinations of calcium carbonate with each of the nitrogen fertilizers in the amounts noted, on nitrogen losses, carbon dioxide evolution, and on changes in the ammonia, nitrate, nitrogen, and carbonate contents of an acid silt loam soil low in organic matter, are reported.

It was found that "for all the soils except those treated with both ammonium sulphate and lime, about 0.3 lb. of ammonia nitrogen was given off in 12 weeks. If kept up throughout the year, this would mean a loss of a little over a pound per acre in a year, an insignificant amount when compared to that lost by leaching, cropping, etc. The loss from the soils treated with both lime and ammonium sulphate was about ten times as high for the period of the experiment, but it is not at all probable that this rate would be held for a very long period after the application of the sulphate. Therefore, . . . the danger of loss of ammoniacal nitrogen from the soil of the type used is practically negligible. In a general way, the total nitrogen determinations show there is a smaller loss or a greater gain of nitrogen for the limed soils than the corresponding unlimed soils."

The results with reference to the amounts of carbon dioxide evolution were inconclusive and the experiment is being continued.

A list of 22 references to literature bearing on the subject is given.

The influence of some common humus-forming materials of narrow and of wide nitrogen-carbon ratio on bacterial activities, P. E. BROWN and F. E. ALLISON (*Soil Sci.* 1 (1916), No. 1, pp. 49-75).—Experiments, conducted at the Iowa Experiment Station, with a slightly acid sandy loam soil low in organic matter content to determine the influence of applications per acre of 15 tons of each of horse, cow, and rotted manure; 2.5 tons of oat straw; 3 tons of corn stover; 2 tons of timothy hay; and 4 tons of each of cowpea and clover hay, on ammonification, nitrification, and nitrogen fixation, are reported.

It was found that "application of the common humus-forming materials in maximum amounts for farm conditions and in a dried condition increased bacterial activities, ammonification, nitrification, and azotification to a considerable extent. Horse manure, cow manure, and rotted manure gave the greatest effect on ammonification in most cases, although timothy hay surpassed the horse manure and cow manure in the extent of its effect in several instances. The oat straw and corn stover had a lesser effect than the manures, and the legume hays, clover, and cowpeas showed the least effect on ammonification of any of the materials used.

"Increases in ammonification due to the applications of humus forming materials were independent of the nitrogen-carbon ratio of the materials added. . . . The dried-blood-fresh-soil method gave better results for ammonification than the casein-fresh-soil method. The latter gave better duplicate results, but the differences between different soils were not nearly so pronounced. . . .

"Nitrification was increased in much the same way as ammonification by the various organic materials. The leguminous green manures exerted, however, somewhat greater effects than the manures, and also more influence than the nonlegumes. These results were the opposite of those secured with ammonification, but the differences were not great enough to permit of definite conclusions. Increases in nitrification brought about by the various materials were apparently independent of the nitrogen-carbon ratio in the substances. Indications of a greater effect of materials of a narrower ratio over those of a wide ratio can not be considered conclusive.

"Azofication or nonsymbiotic nitrogen fixation was favored by manure to a large extent. Straw, stover, and nonleguminous hays had almost as great an effect as to the manures, and the leguminous hays had the least effect of any of the materials used. The nitrogen-carbon ratios of the materials employed were of little or no significance in indicating their effects on azofication. There were indications, however, that nonlegumes and straws might increase azofication in soils to a large enough extent to make their use more profitable than that of legumes. . . . Dextrose gave better results in the azofication experiments than mannite. . . .

"There was little similarity between the effects of the different organic materials on the different bacterial processes. . . . The manures and legumes increased the first crop of oats, except in the case of the horse manure, which apparently exerted an injurious effect on the crop in its early stages of growth. . . .

"The substances with wide nitrogen-carbon ratio decreased the crop yield, while those of narrow ratios gave increases. The nitrogen factor was evidently very important on this soil. The nitrogen-carbon ratio of the organic materials seemed to be of importance in determining the influence on the first crop of oats. If opportunity is to be given for nonlegumes to exert as good an effect as legumes, by increasing azofication to a sufficient extent to offset the nitrogen supplied by the legumes, the organic materials must be allowed sufficient time for considerable decomposition to occur before a crop is grown. . . . The influence of the various substances applied to the soils was noted on a second crop of oats, but the relative effects were different. The nonlegumes had as great an influence as the legumes. . . . The nitrogen-carbon ratio of the materials applied to the soil did not seem to be of as much importance in determining the effect on the second crop of oats as in the case of the first crop."

Four references to literature bearing on the subject are cited.

Contribution to the question of the action of stimulants on plant development, B. SCHULZE (*Landw. Vers. Stat.*, 87 (1915), No. 1, pp. 1-24, fig. 1; *abs. in Jour. Chem. Soc. [London]*, 108 (1915), No. 636, 1, p. 926; *Jour. Soc. Chem. Indus.*, 34 (1915), No. 22, p. 1157; *Chem. Zentrbl.*, 1915, II, No. 11, p. 622).—Pot experiments on a clay soil mixed with compost to determine the stimulating influence of the hydroxid, carbonate, nitrate, phosphate, and sulphate of manganese and of aluminum sulphate, singly and in different combinations, on the growth of sugar beets, when added in amounts equivalent to from 1.2 to 12.2 gm. of manganese per 20 kg. of soil, are reported.

It was found that all the manganese salts used produced an increase in the beet root yield. The most favorable influence was exerted by the manganese phosphate in all amounts added and by the combination of manganese sulphate with aluminum sulphate. The small additions of manganese nitrate produced the greatest increases. All increases in yield are attributed only to the stimulating influence of the manganese.

A second set of pot experiments on a productive cultivated soil to determine the influence of a radio-active fertilizer on the growth of oats, white mustard, and peas when added in amounts of 0.4, 0.8, 1.6, and 4 gm. per 21 kg. of soil in zinc pots, and in amounts of 0.23, 0.46, 0.92, and 2.3 gm. per 13 kg. of soil in clay pots, is reported. It was found that the radio-active fertilizer was especially active in stimulating fruit formation and that this influence was exerted without an undue exhaustion of the nutritive constituents in the soil. No injury to the crops through the larger additions of the radio-active fertilizer was observed.

The influence of certain organic materials upon the transformation of soil nitrogen, R. C. WRIGHT (*Jour. Amer. Soc. Agron.*, 7 (1915), No. 5, pp. 193-208, figs. 7).—Experiments on the influence of dried, fresh, and rotted stable manure, mature wheat straw, starch, cellulose, glucose, dextrose, and green manures on nitrogen in the forms of ammonium sulphate, potassium nitrate, and peptone and on the original nitrogen in sandy and clay loam soils, greenhouse bench soil, orange grove soil, and silty loam soil are reported.

From the results the conclusion is drawn "that in agricultural practice the plowing under, in an undecayed state, of straw or strawy material such as old hay, litter, leaves, stalks, strawy manure, fresh stable manure, and even green manures or cover crops that have been allowed to become mature or nearly so, will serve to reduce the quantity of available nitrogen in a soil. When such a practice is followed only during fall plowing and in a region with a fairly open winter . . . a sufficiently advanced stage of decomposition would be reached by spring not to interfere with normal nitrification. . . . Plowing under of green manures presents a different problem because very little resistant cellulose material is added. Such succulent green material is readily attacked by saprophytic micro-organisms and rather rapid decay accompanied by vigorous nitrification takes place, thus maintaining the supply of available nitrogen."

The fixation of nitrogen in stable manure, GEMMACH (*Ztschr. Ver. Deut. Zuckerindus.*, No. 717 (1915), II, pp. 537-554, fig. 1).—The results of several experiments are briefly reported which indicate that the addition of superphosphate, certain potash salts such as kieserite, or acid salt by-products from chemical industries to liquid manure in amounts sufficient to produce an acid reaction will cause a marked reduction in nitrogen losses. A film of oil over the top of liquid manure had the same effect. Everything considered, however, the best results were obtained from the use of superphosphate.

Fertilizer experiments with different ammonium salts in Weihenstephan in 1915, AUM (*Mitt. Deut. Landw. Gesell.*, 30 (1915), No. 46, pp. 696-699).—Field experiments with early potatoes and with rotations of wheat, oats, and potatoes and potatoes, wheat, and beets on marly loam and deep mild loam soils to compare the fertilizing value of ammonium chloride, ammonium carbonate, ammonium-sodium sulphate, ammonium nitrate, ammonium sulphate, sodium nitrate, calcium nitrate, and lime nitrogen with nitrogen contents of 23.1, 18.76, 7.65, 34.2, 13.9, 16.01, 12.64, and 13 per cent, respectively, are reported. The fertilizers were added in amounts equivalent to 30, 45, and 60 kg. per hectare (26.7, 40, and 53.4 lbs. per acre) of nitrogen.

It was found that the ammonium salts, the ammonium-sodium sulphate and ammonium chlorid gave results equal to those given by ammonium sulphate. Ammonium carbonate was too unstable to be effectively handled. Lime nitrogen when properly used gave results very little inferior to those given by the other fertilizers. Ammonium nitrate was found to be an effective and easily handled fertilizer. All the fertilizers gave increases in spite of the already rather high producing power of the soil for beets, calcium nitrate being in general more effective for this crop than sodium nitrate or ammonium nitrate.

Fixation of atmospheric nitrogen, L. L. SUMMERS (*Trans. Amer. Electrochem. Soc.*, 27 (1915), pp. 339-383, figs. 5).—This article reviews the known processes of commercial nitrogen fixation, points out that the electrical processes for nitrogen fixation have a very low efficiency, and maintains that combinations of electrical and chemical methods promise the most important developments. Comparative figures are given showing the amount of energy necessary per kilogram of nitrogen fixed, and the general economics of the subject are discussed.

The cyanamid process, F. S. WASHBURN (*Trans. Amer. Electrochem. Soc.*, 27 (1915), pp. 385-407).—The details and economics of this and related processes are discussed.

The utilization of bones as fertilizer, F. LAVENIR (*Bol. Min. Agr. [Buenos Aires]*, 19 (1915), No. 8-9, pp. 569-576).—The results of analyses of fresh, degreased, and burned bones are reported and discussed, and methods of treatment described. It is considered evident that for certain plants (especially alfalfa) the treatment of bones by heat or with sulphuric acid to form superphosphate is not justified.

A reconnaissance for phosphate in the Salt River Range, Wyoming, G. R. MANSFIELD (*U. S. Geol. Survey Bul.* 620-0 (1916), pp. 331-349, pl. 1).—This report describes the geography and geology of the locality and reports a study of the phosphate deposits.

"The data thus far available indicate that the phosphate deposits of the Salt River Range are probably inferior to those of southeastern Idaho both in thickness and in quality. There is, however, a considerable body of medium-grade rock which may be considered as a valuable reserve deposit. If the plan of grinding and applying phosphate rock directly to the soil without chemical treatment is found to produce beneficial results, some local demand for this rock might be developed."

The effect of superphosphate on the wheat yield in New South Wales, W. L. WATERHOUSE (*Dept. Agr. N. S. Wales, Sci. Bul.* 10 (1913), pp. 19).—An examination of the soils of the northern, western, and southern sections of New South Wales led to the conclusion that there is a relation between the responsiveness of these soils to the application of superphosphate in the production of wheat and the phosphoric acid content of the soils. This relation is more marked for the available phosphoric acid than for the total phosphoric acid content.

Evaporation of brine from Searles Lake, California, W. E. HICKS (*U. S. Geol. Survey, Prof. Paper* 98-A (1916), pp. 1-8, figs. 2).—In continuation of experiments previously noted (*E. S. R.*, 34, p. 425) samples of natural brine from Searles Lake, Cal. (*E. S. R.*, 33, p. 518), were subjected to fractional evaporation and crystallization. "The data recorded indicates that carefully controlled fractional evaporation and crystallization, possibly combined with other treatment, promise much as a means of obtaining potassium from brines similar to that of Searles Lake."

Twenty questions on lime, F. E. BEAR (*West Virginia Col. Agr. Ext. Dept. Circ. 47 (1915), pp. 16, figs. 7*).—This is a brief popular summary of results obtained at different state experiment stations on the purchase, preparation, and use of different forms of lime in agriculture.

Sulphur in relation to soils and crops, J. W. AMES and G. E. BOLTZ (*Ohio Sta. Bul. 292 (1916), pp. 221-256*).—This bulletin deals with the sulphur supply of soils, reporting analyses of typical Ohio soils, and reports field experiments at the different experimental farms of the Ohio Station to determine the importance of sulphur as a factor in crop production.

It was found that "soils well supplied with organic matter contain more sulphur than soils containing a smaller amount of organic residues. Sulphur is similar to phosphorus in that larger amounts of both these elements are distributed in the surface soil than in the lower strata.

"Treatment with fertilizer materials supplying sulphates increased the sulphur content of the soil over that found in unfertilized soil. Soil treated with acid phosphate and ammonium sulphate contained more sulphur than soil receiving acid phosphate alone. Cultivation of silt loam soil for 16 years without the addition of fertilizers decreased the total sulphur supply.

"Water extract of soils obtained by leaching 200 gm. of soil with 2,000 cc. of water shows that there is a considerable accumulation of sulphates in silt loam soil deficient in organic matter. Treatment with acid phosphate has not increased the sulphate content over that found in unfertilized soil. Ammonium sulphate used in combination with acid phosphate decidedly increased the accumulation of sulphates. . . . A much less proportion of the total sulphur is found in the water extract of soils containing more organic matter and total sulphur. The amount of soluble sulphur obtained in the water extract of soils indicates a sufficient supply of available sulphur, assuming that sulphur as sulphates is a satisfactory form of this element.

"The 20-year average yields of the Wooster 5-year rotation fertility experiments show that phosphorus carriers (acid phosphate and dissolved bone black) containing sulphates, compared with bone meal and basic slag, produced more corn, oats, and wheat. Bone meal and basic slag increased the yields of clover and timothy. . . .

"Acid phosphate, compared with bone meal and basic slag in a 3-year rotation of potatoes, wheat, and clover has given larger yields of potatoes and wheat. In the 5-year rotation experiment conducted for 10 years on Strongsville clay, containing more sulphur than the Wooster silt loam, acid phosphate, compared with bone meal and basic slag, has given larger yields of corn, oats, and timothy. The yields obtained show that bone meal and basic slag are more effective than the dissolved boneblack used on this soil. The 3-year rotation fertility plots*on Miami clay loam, which have had sulphur supplied by both acid phosphate and potassium sulphate, have produced less tobacco, wheat, and clover than plots to which muriate of potash and acid phosphate were added. . . .

"Under certain conditions of treatment, sulphates have increased the yield of soy-bean hay and the sulphur content of the crop. The addition of calcium sulphate to fertilizer treatment furnishing nitrogen, phosphorus, and potassium decreased the sulphur content of soy beans. Potassium sulphate and ammonium sulphate, compared with potassium chlorid and sodium nitrate, gave an increased yield of beans having a lower percentage of sulphur. Sulphates used with complete fertilizer and calcium carbonate decreased the yields of millet hay and millet seed. Sulphates considerably increased the accumulation of sulphur in millet hay and in soy-bean hay and decreased the content in the seed. No inorganic sulphur was found in soy beans and millet seed. Calcium sulphate in

addition to complete fertilizer increased the yield of rape. The proteid nitrogen and organic sulphur content of rape grown on soil treated with sulphates in addition to dicalcium phosphate, potassium chlorid, and sodium nitrate has been increased. The increased amount of sulphur assimilated by the rape crop, from soil treated with sulphur in addition to phosphorus, potassium, and nitrogen, is mostly combined as organic sulphur. The nonproteid nitrogen found in the rape plant grown under the conditions of this experiment is in excess of the proteid nitrogen.

"On limed soil calcium and magnesium sulphate, in addition to phosphorus, potassium, and nitrogen, increased the yield over that from similarly treated plats receiving no sulphates. Potassium and ammonium sulphate on limed soil also produced more rape than plats where potassium chlorid and sodium nitrate furnished the potassium and nitrogen. Magnesium sulphate, where used with complete fertilizer and calcium carbonate, produced more soy beans and millet seed than calcium sulphate.

"The use of sulphur and hydrogen sulphid in pot tests increased the acidity of the soil. Pots so treated gave a greater weight of clover than the untreated or limed pots.

"Experimental data obtained by extracting mixtures of soil, sulphur, and rock phosphate with 0.2 per cent hydrochloric acid indicate that oxidation of sulphur has increased the solubility of the insoluble phosphorus."

A list of 25 references to literature bearing on the subject is appended.

The fertilizing power and harmfulness of fertilizing materials, A. VIVIEN (*Bul. Assoc. Chim. Sucr. et Distill.*, 52 (1914), No. 1-2, pp. 36-42; *obs. in Chem. Ind.*, 9 (1915), No. 21, p. 2962).—The author reviews work by himself and others showing the toxic effect of different salts on plants, and gives the toxic dose of each of 16 sodium, potassium, ammonium, and calcium salts for Bordeaux wheat. It is pointed out that sugar beets may be grown on soils containing amounts of salts which would be toxic to other crops, as the beets absorb the salts and gradually remove the excess of mineral matter from the soil. Such sets are said, however, to yield a sugar solution of low purity.

Fertilizer registrations for 1916, C. S. CATHCART (*New Jersey Stat. Bul.* 56 (1916), pp. 5-32).—This bulletin contains a list of 1,137 brands of fertilizers and their guaranties, as registered in New Jersey for the year ending October 1, 1915.

AGRICULTURAL BOTANY.

An experimental study of the rest period in plants: Physiological changes accompanying breaking of the rest period, W. L. HOWARD (*Missouri Sta. Research Bul.* 21, pp. 3-72, figs. 10).—In continuation of the author's study on the rest period of plants (*E. S. R.*, 33, p. 520), a description is given of physiological investigations conducted to secure information on the specific effects produced by anesthetics and other agents employed in breaking the rest period of woody plants.

As a result of respiration and other studies, the conclusion is believed justified that the specific effect of all rest period breaking agents on dormant woody tissue is the stimulation of the enzymes. The rest period is believed to begin with the inhibition of enzymes by the accumulation of the products of their work. This may take place in mid or late summer. In the fall an excess supply of carbohydrates continues to be accumulated with the further inhibition of enzymes. This brings about the main or middle state of rest. Toward the end of this period enzymes become more and more active, giving place to the beginning of growth. The length of the rest period is said to vary greatly

with the different species, in some extending from June or July to March or April, while with others growth may begin again after two or three weeks of dormancy.

An extensive bibliography is appended.

The bearing of certain senile changes in plants on present theories of senility, H. M. BENEDICT (*Abs. in Science, n. ser.*, 43 (1916), No. 1104, p. 286).—In a previous publication (E. S. R., 34, p. 222), the author described senile degeneration in *Vitis vulpina*, and in the present paper he gives an account of various theories regarding this phenomenon. He favors that advanced by Kassowitz, that senility is due to an accumulation of inert catabolic products, and he suggests that a more fundamental cause of senility may be found in the colloidal constitution of protoplasm with its units in the form of molecular complexes.

The favorable influence of nitrogen salts on seeds sensitive to light, G. GASSNER (*Jahrb. Wiss. Bot. [Pringsheim]*, 55 (1915), No. 2, pp. 259-342; *abst. in Ztschr. Bot.*, 7 (1915), No. 9, p. 580).—Giving the detailed results of extensive experimentation, the author states that the germination of seeds of *Ranunculus sceleratus*, *Oenothera biennis*, and *Chloris ciliata* is favorably influenced by light. This effect in case of the first named required variations of temperature, and these variations themselves favored germination. In case of *O. biennis*, light favored germination at both constant and varying temperatures. Seeds of *C. ciliata*, when freed from chaff, were not so influenced by temperature variations, and light acted favorably in this respect only at temperatures of about 20° C. and upward. It is stated that germination is favored not by nutritive media as such, but by salts containing nitrogen as nitrites, nitrates, and ammoniates, the effects of which in this respect are perceptible through a very wide range of concentrations.

The author also discusses recent related experimentation as reported by Ottenwilder (E. S. R., 33, p. 826).

New instances of the promotion of germination, by nitrogen compounds, of seeds sensitive to light, G. GASSNER (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 4, pp. 217-232).—Discussing the tabulated results of tests with plants in widely separated families, the author emphasizes the fact that in these cases nitrogen variously combined in the nutritive media was found to show the same favorable action as did light. Some doubtful or contradictory results are reported.

Studies on light and temperature as related to the germination of seeds, G. GASSNER (*Ber. Deut. Bot. Gesell.*, 33 (1915), No. 4, pp. 203-217).—Giving the results of studies by other investigators the author reports a continuation of his own work (see above), using seeds of nine species of Onagraceae, one of Hydrophyllaceae, and two of Scrophulariaceae.

It is stated that in the first group three different germination types may be distinguished as regards their relation to light and temperature. The second division is characterized by a low germinability optimum and by the injurious action of high germination temperatures, the favoring action of temperature change, and the unfavorable action of light at extreme germinating temperatures. In the third group, the seeds require stronger light at low temperatures. Temperature variations here also favor germination, especially when regular, giving the most marked results when the lower daily temperatures were maintained for longer periods than were the higher temperatures.

Influence of temperature on the moisture intake of seeds, C. A. SULL (*Abs. in Science, n. ser.*, 43 (1916), No. 1105, p. 329).—According to the author a critical analysis of the data obtained as to the rate of moisture intake at various temperatures by seeds possessing semipermeable coats, shows that the

curve of intake is by no means so simple as that reported for barley by Brown and Worley (E. S. R., 28, p. 226). The temperature coefficient for the rate of intake is said to be decidedly lower than the Van't Hoff coefficient for chemical processes and considerably lower in the case of *Xanthium* than the values obtained with barley seeds. It is considered that the conclusions reached by Brown and Worley are not generally applicable.

Seed sterility and delayed germination in *Oenothera*, B. M. DAVIS (*Abstr. in Science*, n. ser., 43 (1916), No. 1104, p. 291).—From a study of 50 or more species, races, and hybrids of *Oenothera*, the author reports considerable seed sterility and delayed germination. A method is suggested for rapidly forcing germination and for preserving for examination the residue of sterile seedlike structures.

The influence of the medium upon the orientation of primary roots, R. M. HOLMAN (*Abstr. in Science*, n. ser., 43, (1916), No. 1105, pp. 328, 329).—By the use of media whose resistance to penetration by the root tip could be widely varied, the author was able to cause roots to behave very nearly as in the air or in the same manner as in the earth, according as the medium was loose or considerably compressed. These experiments are believed to indicate that the effect of the medium is primarily, if not exclusively, mechanical. Secondary roots of the species investigated behaved in a manner similar to the primary roots, reacting more promptly in media offering considerable resistance to penetration than in looser media.

The root growth of forest trees, W. B. McDUGGALL (*Abstr. in Science*, n. ser., 43 (1916), No. 1105, p. 324).—Observations made on the roots of *Acer saccharinum*, *Vitis americana*, *Carya alba*, and *Quercus macrocarpa* are reported for the growing season and during the winter from April, 1914, to September, 1915.

It was found that the root growth of forest trees begins as early in spring as the soil is warm enough for absorption and ceases in autumn when the soil becomes too cold. No summer resting period was found necessary. Where a summer resting period was observed, it was found to be due to a lowering of the water supply and not to any inherent tendency to periodicity.

The influence of electrical conditions in plants on the absorption by their roots of nutritive substances, D. SIVUSHAK (СИВУШАК), (*Zhur. Opitn. Agron.*, 16 (1915), No. 4, pp. 249-269, figs. 5).—In continuation of previous work (E. S. R., 32, p. 328), the author states that experimental tests as tabulated show that up to a certain point the direction and intensity of the electric current passed through a plant condition the absorption of cations and of anions and determine the rate thereof. These variations in the absorption rate are apparently independent of electrolysis, as they do not follow Faraday's law. Dead and living wheat plants give results of the same character.

These facts suggest that some substances, probably colloidal, may be differently polarized under the influence of charges of different sign and intensity up to certain limiting values. Such charges are said to be directly observable in the absence of a current by the use of a delicate electrometer and to be modifiable by the addition of salts. The variations in rapidity of absorption of cations and in intensity of current show a degree of correspondence. It is thought that the electrical conditions in the roots of plants may be of significance in plant nutrition.

The structure of the bordered pits of conifers and its bearing upon the tension hypothesis of the ascent of sap in plants, J. W. BAILY (*Abstr. in Science*, n. ser., 43 (1916), No. 1105, p. 329).—Attention is called to the tension hypothesis of the ascent of sap in plants, which, as interpreted by Dixon, postulates continuous columns of water that are entirely free from bubbles of air or gas. The pit membranes of conifers are said to be not entire septa, and not to

be entirely impervious to undissolved gases and solids. Consequently the surface tension of the sap in the sieve-like pit membranes is not sufficiently great to prevent the penetration of air or gas under the tensile strains that are supposed to occur in tall trees.

Anatomical and physiological studies on the aquiferous vessels in plants. II, L. MONTMARTINI (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 12 (1915), pp. 353-353, pls. 10).—Claiming to have found that the number of conducting vessels in various plants increases from below upward, especially in the neighborhood of branches, and showing also in some cases a certain relation with the development of surface in the related transpiring organs, the author gives a detailed account of his recent studies on the number and size of the aquiferous vessels and the modifications of the woody elements in relation therewith.

He sums up much of the extensive data obtained from this work by stating that the quantitative and qualitative modifications which can be noted in the wood at various heights in an organ or system of organs, and which are variously combined according to species, individual, or environment, tend on the whole to increase toward the active wood, and more particularly that part which is in more intimate relation with the vascular elements, when measured by the number of the cells which are in direct contact with such elements. Both structure and content in these regions indicate very active changes between the vessels and the cells which surround them. This becomes more and more evident as parts are examined in regions showing greater activity of the transpiration stream.

A bibliography is appended.

On the permeability of certain nonliving plant membranes to water, F. E. DENNY (*Abs. in Science*, n. ser., 43 (1916), No. 1105, p. 329).—A report is given of a series of experiments with plant membranes in which quantitative measurements were made of their permeability to water. The membranes used were those of the seed coats of peanut, cycad, almond, English walnut, pumpkin, bulb-scale of onion, etc. Results are reported showing the temperature coefficient for a rise of 10° C., and also showing the permeability of the membranes as affected by the concentration of the bathing medium, direction of flow through the membrane, and as influenced by certain chemical constituents of the membrane.

Studies in permeability.—II, The effect of temperature on the permeability of plant cells to the hydrogen ion, W. STILES and I. JØRGENSEN (*Ann. Bot. [London]*, 29 (1915), No. 116, pp. 611-618, figs. 4).—Reporting a continuation of investigations previously noted (*E. S. R.*, 34, p. 731) by methods which are further detailed, the authors claim to have shown that the rate of absorption of the hydrogen ion of hydrochloric acid in dilute solution by potato cells shows a simple exponential relation between time and the concentration of the acid, the absorption rate of potato cells being increased about 2.2 times for each 10° C. rise between 0 and 30°.

The production, by use of paraffin, of hypertrophic and hyperplastic growths in shoots, E. SCHILLING (*Jahrb. Wiss. Bot. [Pringsheim]*, 55 (1914), No. 2, pp. 177-258, figs. 43).—Giving an account of the anatomical and physiological effects of artificially closing the stomata, the author states that the resulting changes observable in the shoot axis are due not to any chemical influence of paraffin or vaseline but to the limitation imposed by them upon the transpiration process, and perhaps also to the corresponding limitation of oxygen access. It is stated that in the overgrown cells the osmotic pressures are various but generally higher than in the normal cells. It is claimed also that by covering the surface of the twigs with paraffin, abnormal leaves and adventitious roots may be produced.

Some factors determining the presence of fat as a food reserve in woody plants, E. W. SINNOTT (*Abstr. in Science, n. ser.*, 43 (1916), No. 1105, p. 328).—Reserve fat is said to occur most abundantly in those woods in which the rays and parenchyma cells are comparatively thin-walled and well provided with pits, and to be particularly well developed in the cells immediately adjacent to the vessels. The fat is said to be practically absent in species with thick-walled, slightly pitted parenchymatous tissue.

These facts are claimed to suggest that the occurrence of fat in wood and its distribution may depend on the easy diffusion of some fat-forming ferment. Experiments show the presence of a fat-splitting ferment in the leaves and bark, which varies greatly in amount according to species and season but which is in general most abundant in the spring in those species in which reserve fat is most abundant in winter. It is suggested that this fat-splitting ferment may be reversible in its action, and during late summer and fall it may be diffused downward through the wood and bast, converting into fat the food reserve to which it has access.

On the properties of a chromogen generally present in plants, J. WOLFF and NAMA ROUCHELMANN (*Compt. Rend. Acad. Sci. [Paris]*, 161 (1915), No. 13, pp. 399-401).—The authors, having extended their study as previously reported (E. S. R., 34, p. 32) to a number of plant families, state that the chromogens exhibit, besides their great sensitiveness to the action of laccase and hydriodic acid, a large number of characters in common, some of which are here enumerated, indicating that they should probably be regarded as one and the same. The brown coloring matters that form in various plants or organs may be regarded as products of oxidation, as observable in case of the brown pigment of cut or injured potatoes, horse chestnut, dead leaves, and macerated green plants when subjected to the action of a laccase.

Lipolytic action in germinating teliospores of *Gymnosporangium juniperi-virginianæ*, G. H. COONS (*Abstr. in Science, n. ser.*, 43 (1916), No. 1105, p. 327).—A study was made of the teliospores from mature telial horns of *G. juniperi-virginianæ*, which seemed to indicate that in the germinating spores lipase is present. This places the rust fungi in the list of organisms now known to possess lipase. Attention is called to the occurrence of oil in rust spores, and the conversion of the globules of oil into soluble products, brought about by the lipase, is considered a factor in the rapid germination process.

Acidity and gas interchange in cacti, H. M. RICHARDS (*Carnegie Inst. Washington Pub.*, 209 (1915), pp. 107, figs. 6).—The author gives an account of the methods and results of his work as carried out with cacti at the Desert Botanical Laboratory at Tucson, Ariz., along three main lines, namely, the determination of the acidity of the tissue as regards the expressed juice and the total amount of acid present, the determinations of carbon dioxide evolution to fix the diurnal periodicity in relation to normal temperature changes and to ascertain the effects of various agencies upon the rate, and the study of the gas interchange in darkness between plants and the atmosphere. The results are given in considerable detail and discussed in their bearings.

It is stated that with rising acidity in the tissues, the total acid increases more rapidly than does the concentration of the juice. Light, the most important factor in the diurnal decrease of acidity, is less effective at the lower temperatures. Rising temperature, especially above 30° C., decreases acidity when this is initially high, but does not wholly inhibit its production. Acidity tends to decline with excess of oxygen and to increase with deprivation thereof. While excess of oxygen raises the carbon dioxide-oxygen ratio, this ratio remains stationary or decreases in its absence. Wounding causes an increase

in acidity related to its extent. The acid content does not vary greatly with age, except in very young tissue. The actual rate of carbon dioxide production is greatest in the youngest tissues, next in the old turgid joints, and least in the flaccid joints, the gas interchange ratios varying according to the acidity conditions rather than according to the age of the tissue. In general, high acidities, high evolution rate of carbon dioxide, and high carbon dioxide-oxygen ratios are associated. No difference of acidity was found between the base and the tip of the joint, but most of the acid was held in the layers of soft, highly turgid cells outside the bundle ring. Some discussion of the bearings and implications of the facts as observed is also given.

Localization of acids and sugars in fleshy fruits, E. DEMOUSSY (*Compt. Rend. Acad. Sci. (Paris)*, 161 (1915), No. 15, pp. 443-445).—Tabulated results of analyses of the juices obtained from a number of fleshy fruits by employment of graduated pressures show that the increase of acidity and reducing sugars due to pressure, while considerable in case of a few fruits, was slight, lacking, or negative in others, so that a positive increase can not be considered as general. The variations due to pressure in case of nonreducing sugars were usually opposite in direction to those in acidity and in reducing sugars. The chemical composition of a fruit varies in different fruits in portions apparently homogeneous otherwise and in spite of the fact that they may have the same proportion of water, which appears to circulate more readily than do certain solutes.

These studies are considered to have brought out striking conformities to the law announced by Maquenne (*E. S. R.*, 8, p. 844), according to which soluble bodies tend to accumulate at points in the living organism where there is a lowering of the osmotic pressure. This law is used to explain such phenomena as the accumulation of acid in certain portions of fruits during the process of cooking.

What are chondriosomes? D. M. MOTTIER (*Abs. in Science*, n. ser., 43 (1916), No. 1104, pp. 286, 287).—In addition to the chondriosomes occurring in higher plants, which become leucoplasts in case they occur in the roots and chloroplasts when in the stems, the author calls attention to the presence in cells of certain plants of other bodies similar in structure and reaction which do not develop into either leucoplasts or chloroplasts. These bodies are said to be always present in the form of granules or delicate rods, and, as they are permanent organs, they should be given morphological rank. They do not arise from the nucleus, and the question is raised as to whether the term chondriosome should be applied to the organs under discussion.

Rapid methods for quantitative and qualitative studies on the soil flora. T. F. MANNS (*Abs. in Science*, n. ser., 43 (1916), No. 1104, p. 288).—For the rapid study of soil organisms, the author suggests the use of a mechanical shaker in conjunction with suitable media. It is claimed that where the shaker was used it was possible to plate 16 soils in duplicate plates with 2 dilutions on four different media in from 2½ to 3 hours. Usually three media will suffice to bring out the important groups, one for the ammonifying organisms and the saprophytic forms, including molds, etc., a second for *Bacillus radicicola*, and a third for *Azotobacter*, *B. radiobacter*, and nitrifiers.

Media for quantitative and qualitative studies on *Azotobacter* and nitrifiers, T. F. MANNS (*Abs. in Science*, n. ser., 43 (1916), No. 1104, pp. 288, 289).—In making a survey of the bacteria in various groups of soil organisms, the author found that a soil extract agar, to which was added 0.5 gm. of a mixture of insoluble salts, would bring out the nitrogen-fixing organisms and the nitrifying organisms.

Peat organisms that slowly liquefy agar, T. F. MANNS (*Abs. in Science*, n. ser., 43 (1916), No. 1104, p. 289).—While making a study of the flora of raw peat and muck, the author observed that certain colonies of bacteria were able to break down the agar and cause a deep pitting in the medium. The organism appears to be a micrococcus and to be most abundant in peat that is composted with ground calcium phosphate and calcium carbonate.

The transmission by maize seeds of the effects of detasseling, E. HECKEL (*Compt. Rend. Acad. Sci. [Paris]*, 161 (1915), No. 12, pp. 338-340; *Prog. Agr. et Vil. (Ed. l'Est-Centre)*, 36 (1915), No. 50, pp. 570-572).—Following up his previous work (E. S. It., 33, p. 426), the author took four strains of Giant Serbian maize bred during the previous four years, the stalks being detasseled each year after the accomplishment of fertilization, and after detasseling the stalks August 20, 1915, tested them at intervals for sugar, as possibly showing the cumulative effects of traumatism on the sugar content.

Each of the four series tested, while showing an increase over its control in saccharose and a decrease in glucose, showed an increase in the total of both, the greatest percentage of total increase of these sugars being obtained from the strains previously showing only moderate sweetness, and the maximum increase being attained in 24 days after detasseling. Starch was present in all the stalks that had been detasseled.

Experiments in recombining endosperm colors in corn, R. A. HARPER (*Abs. in Science*, n. ser., 43 (1916), No. 1104, p. 290).—Attention is called to the fact that well-established black races of corn, when crossed with white races, give, both in the F₁ and F₂ generations, a series of colors including dark purples, reds, blues, grays, etc. The author has undertaken a series of recombination tests, but no immediate and uniform return to the ancestral black has been obtained as yet.

The chlorophyll factors in *Lychnis dioica*, G. H. SHULL (*Abs. in Science*, n. ser., 43 (1916), No. 1104, p. 290).—According to the author, three Mendelian factors are responsible for the chlorophyll of the normal dark green biotypes of *L. dioica*. One of these differentiates all green strains from albinos and is capable only of ephemeral existence. A second, acting in conjunction with the first, produces a form with possibly two-thirds as much chlorophyll as the normal. The third factor acts in conjunction with the other two to produce the full green color.

Orthogenetic saltation in *Nephrolepis*, It. C. BENEDICT (*Abs. in Science*, n. ser., 43 (1916), No. 1104, p. 292).—The author describes some forms of discontinuous variation in *N. exaltata bostoniensis*. In this variety there are said to be at least three distinct lines of variation, progressive dwarfing, progressive increase in division of leaf, and progressive increase of waviness of leaf, each variation being represented by a number of forms.

Evidences of hybridism in the genus *Rubus*, C. S. HOAR (*Abs. in Science*, n. ser., 43 (1916), No. 1104, pp. 290, 291).—The author presents morphological data considered to favor strongly the occurrence of widespread hybridism in the genus *Rubus*. There is believed to be good evidence from the standpoint of extreme variability and correlated gametic sterility of widespread natural hybridism in this genus.

An interesting modification in *Xanthium*, C. A. SHULL (*Abs. in Science*, n. ser., 43 (1916), No. 1104, pp. 292).—A peculiar modification of burs of *Xanthium* is described, in which the number of the flowers surrounded by the involucre has been greatly increased. The manner in which the form originated is unknown, but it is thought to be either a mutation or a reversion from *X. canadense*.

Transmissibility of characters acquired by plants grown in salt water. P. LESAGE (*Compt. Rend. Acad. Sci. [Paris]*, 161 (1915), No. 15, pp. 440-442).—The author, employing *Lepidium sativum*, has attempted to ascertain whether the characters acquired by plants grown in salt water and persisting in their descendants grown in the same medium for several generations, will persist also when their progeny are grown in fresh water. One year's tests are said to have given positive results and are considered to show the transmissibility by plants of characters acquired in salt water.

Pollen sterility in relation to the geographical distribution of some Onagraceae. C. C. FORSAITH (*Abstr. in Science, n. ser.*, 43 (1916), No. 1104, p. 291).—Studies have been made of species of *Epilobium* and *Zauschneria*, which represent different subgenera of Onagraceae, to determine further evidence of interspecies crossing as found in *Oenothera*. The results are said to show that, from a morphological standpoint, interspecies crossing is not an uncommon occurrence in this family of plants.

A remarkable new *Eysenhardtia* from the west coast of Mexico. W. E. SAMPFORD (*Jour. Wash. Acad. Sci.*, 6 (1916), No. 6, pp. 133-135, fig. 1).—The author describes *E. olivacea* n. sp., and suggests the advisability of a critical study of the entire genus.

FIELD CROPS.

[Work with field crops]. L. R. WALDRON (*North Dakota Sta., Rpt. Dickinson Substa.*, 1913, pp. 5-20, 22-31, figs. 5).—The results of work with different field crops for a number of years are briefly reported.

Alfalfa gave an average yield of two tons per acre for the five years beginning with 1900, and in 1913 a seed production of 112.3 lbs. per acre was recorded. For the five years beginning with 1900, alfalfa in cultivated rows gave an average yield of 1.224 tons per acre and in 1903 a seed crop of 333 lbs. per acre was produced. Disking alfalfa after the first cutting did not give conclusive results, but indicated that with unfavorable moisture conditions the practice tends to increase the yield. Grimm alfalfa from home-grown seed proved to be more winter resistant than Chinook alfalfa from Montana-grown seed. In cultural tests conducted in 1913 the greater amount of seed was produced by the second growth and by thin stands in cultivated rows. Notes on cooperative alfalfa growing and on the results of some breeding work are given.

Cultural tests with sweet clover and sunflowers and a variety test with wheat are also recorded. Among other results with sweet clover a yield from Iowa seed of 524 lbs. of hulled clean seed per acre is noted. Sunflowers made a yield of field cured stalks and seeds of 4.356 tons per acre. This crop is considered of doubtful economic value for that section of the State. In a test of 24 varieties of wheat, Knabanka No. 8, descended from a single plant selected at the station in 1906, ranked first with a yield of 31.6 bu. of grain per acre.

Results of three trials with Girka wheat showed selected strains to be superior in yielding capacity to the bulk lot from which the pure lines were derived. In 1913 Victory, Silvermine, and Golden Rain ranked highest among 11 varieties of oats, with yields of 65.1, 64.5, and 63.4 bu. per acre, respectively. The same year Primus and Swan Neck barley were the heaviest yielders of 8 varieties producing, respectively, 40.7 and 40.2 bu. per acre. The average yields of two 2-rowed and two 6-rowed varieties of barley grown for five years were in favor of the 2-rowed sorts by 45 per cent. A plot of Yaroslav summer produced 33.8 bu. per acre and an adjoining plot of spring rye 21.3 bu. Experiments with wheat, oats, and barley in moisture conservation conducted from 1908 to 1915

showed that clean summer fallow had not been very profitable, especially with oats and barley.

Sixth annual report of the Williston substation for the year 1913. E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1913, pp. 48, figs. 4*).—The results are reported of tests conducted in 1913, mainly, with varieties of spring and winter wheat, oats, barley, emmer, spelt, rye, millet, potatoes, sugar beets, and alfalfa. Cultural experiments with wheat, oats, and potatoes, principally with reference to rate and time of seeding and planting, are also reported, together with a study of hardiness in different species and varieties of medicago, including alfalfa, and meteorological observations at Williston, N. Dak., during 1913 as to temperature, precipitation, and evaporation.

[**Work with field crops in 1915**] (*Rhode Island Sta. Rpt. 1915, pp. 26, 27*).—Tests of varieties of potatoes showed that Clyde was not superior to Norcross and that Enohla was as early as Irish Cobbler and more productive. Norcross potatoes grown at the station did not prove as good for seed as those grown in Maine, and nothing was gained by selecting the seed from the most productive hills, although potatoes selected for two years were superior to unselected stock. The use of 2-oz. potatoes for seed planted 18 in. apart in the row gave about the same yield as planting 1-oz. pieces 9 in. apart, but the yields decreased successively when ounce pieces were dropped 12 and 15 in. apart.

Among several varieties of sweet corn planted April 28, a special strain of Early Cory produced the first pickings August 6 and 9 and yielded about 50 per cent more than commercial seed. The number of dozen ears secured on a given area by the different varieties on and before August 13 was as follows: Golden Bantam, 8; Crosby Early, 41; Quincey Market, 75; Early Cory, 99; Early Cory, special strain, 129. Experiments with three strains of White Cap corn showed no decided difference in yield between the three strains and three crosses from the same.

A yield of 30 bu. of Red Chaff winter wheat was recorded. Mammoth White Rye from Canada was not found superior to Excelsior. Sudan grass planted May 11 in drills 2 ft. apart grew fairly well on acid soil, and when allowed to stand until September 3 yielded 11.5 tons of green material. Mixing a liberal amount of hydrated or slaked lime with the surface soil and subsoil gave no larger yields of alfalfa than where such lime was mixed only with the surface soil. Alfalfa cut on June 1, July 19, and September 14 yielded a total of 4.24 tons of hay per acre as compared with 4.5 tons cut on June 24, August 14, and September 14. A mixture of orchard grass and alfalfa seeded in 1912 yielded 4.2 tons of hay as compared with 4.31 for alfalfa alone.

Crop rotations for upper Wisconsin. E. J. DEWEENE (*Wisconsin Sta. Bul. 222 (1916), 2. ed., pp. 20, figs. 16*).—The first edition of this bulletin has been noted (*E. S. R., 28, p. 40*). The additional statements presented point out that securing the first crop of clover for about two weeks in early spring, or until June 10, retards the time of cutting but without greatly affecting the yield, that in a 3-year rotation for dairy farms manure may be applied on new clover fields in the fall or winter, and that in other rotations corn and potatoes should not follow each other.

Experiments with corn. C. F. NOLL (*Pennsylvania Sta. Bul. 139 (1916), pp. 23, fig. 1*).—These experiments included trials of varieties grown for grain and for silage, tests of selection and care of seed, and breeding work, mainly ear-to-row selection, inbreeding and crossing inbred strains, and crossing varieties. The results of the variety tests are regarded as applicable only to sections of the State with conditions similar to those existing at the station.

For central Pennsylvania, the northern counties with an altitude not quite so great as that of the station, and for the higher altitudes of the southern

counties, Minnesota 13, U. S. Selection 133, 90-Day Clarage, Murdock Yellow Dent, Wisconsin No. 7, and Holmes White-Capped Yellow Dent, varieties grown for grain, and 100-Day Bristol and Reld Yellow Dent, varieties suited for silage, are recommended for trial.

In the selection and care of seed only ears showing perfect germination were planted, and yields were secured from perfect stands. Seed selected on the stalk germinated better than seed selected at husking time in an indoor test in the single year for which the record was kept, but the seed selected at husking time in the three years' trials gave the better field germination, and there was not much difference in the yields. Heavy seed gave a little better field germination and a somewhat better yield than light seed. While seed from ears germinating quickly gave the better field germination, the difference in yield was within the limits of error. Keeping the seed at living room temperature during the winter resulted in better germination indoors and in the field than was obtained with seed kept without artificial heat, but the difference in yield was insignificant.

Ear-to-row breeding of one variety followed by crossing of remnants of the best yielding ears, as shown by yields of seed from the best ear rows and from crosses of the best ears, did not materially increase the yield. Inbreeding very much reduced the size of stalks and yield, while crossing of inbred strains not closely related restored the vigor and productive capacity. Of eight first-generation crosses only two outyielded the better parent, the difference in yield being but little.

The development and properties of raw cotton, W. L. BALLS (*London: A. & C. Black, Ltd., 1915, pp. XII+221, pls. 16, figs. 22*).—The main purpose of this book, it is stated, is to present the history of the development of cotton-lint and, accessory to this purpose, to indicate the development of the plant on which this lint is borne. The chapters presented discuss the development of pedigree, the growth of the cotton plant and the factors which affect it, the structural development of the boll and how this may be influenced by environment, the production and preparation of commercial lint, the growth of cotton culture, and the methods employed in studying and improving the crop. Tables of statistical data are appended.

Note on the classification of the rice of Lower Burma, R. A. BEALE (*Re printed from Poona Agr. Col. Mag., 7 (1915), No. 2, pp. 10*).—Schemes of classification proposed by Kikkawa and Graham among others are briefly discussed, and the botanical characters of rice important in the classification of varieties are enumerated and described. Agricultural characters in themselves are considered an inadequate basis for classification, as they are affected by environment but are regarded of value in this connection only when used in conjunction with botanical characters. A tentative scheme for the classification of the rice of Lower Burma is proposed.

The culture of rice in Spain, H. JUMELLE (*Inst. Colon. Marseille Bul. 1 (1914), pp. 28, fig. 1*).—This bulletin is a popular discussion of the ordinary field practice in the culture of rice as applied in the Province of Valencia in Spain. Statistics of production and marketing are also given.

Annual report of the Bureau of Sugar Experiment Stations, E. G. F. SCRIVEN (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 1915, pp. 52*).—This report reviews the progress of the cane-sugar industry of Queensland and the production of cane and sugar in 1915. The experimental work carried on at the Central Sugar Experiment Station at Mackay, the Southern Sugar Experiment Station at Bundaherg, and in other parts of the State, is briefly noted.

Experiments were conducted to determine the best system of treating ratoons. The different treatments included leaving the trash on the ground and allowing the cane to volunteer, burying the trash between the rows, shifting the trash in every other space between the rows and cultivating the cleared spaces, and burning the trash and opening the middles with plow and subsoiler to a depth of from 16 to 18 in. Under the conditions of a severe drought, leaving the trash gave the best results, but the preceding year, when conditions were normal, burning the trash and giving deep cultivation, which is the station method, proved most profitable. It is concluded from the results that plowing under trash in the ratoons does not pay.

The results of a variety test showed that Q 813 ranked first in sugar content followed by Q 990 and Q 137. Experiments with canes from the Queensland Acclimatization Society were continued and the second ratoon crop was harvested. Badila Seedling and Hybrid No. 1 gave the highest percentage of pure, obtainable cane sugar.

Different cultural methods compared resulted in the highest total yield of plant crop of 1914 and the first ratoon crop of 1915 on the plot giving shallow cultivation with broad hoes and on the one cultivated with a light drill harrow fitted with straight sharp tines. In a test to determine whether cane sets cut from arrowed canes have a prejudicial effect on the germination and subsequent yield, it was found that the cane from arrowed cane sets not only produced a greater stand of cane but also a greater yield.

Analytical tests to determine the commercial value of a number of generally grown varieties showed that HQ 423 and Badila gave much better yields of pure obtainable cane sugar than Gora, Cheribon, Malabar, and Otumite. Early or late planting apparently had no effect on the average sugar content of Cheribon, Malabar, and Otumite, while in the other three varieties the late planting gave better average analyses. In a second test HQ 423 and Badila also ranked first.

The Mackay station laboratory reported tables of analyses showing the quantities of lime, potash, phosphoric acid, and nitrogen removed in crops of cane of the weight grown. It was shown that more potash is removed than nitrogen, lime, and phosphoric acid.

At the Southern Sugar Experiment Station at Bundaberg, planting cane in rows 5, 6, or 7 ft. apart showed that the closer planting produced the better yields. It was further found that planting tops only gave much better results than planting middles or bottoms and middles. The results of cultural tests were in favor of subsoiling but the cost was too high to be profitable. Cane volunteered through trash, owing to a dry season, gave the largest margin of profit, but this method is not advised as under normal conditions cultivation usually gives much better results. Analyses of burnt canes indicated that the cane did not depreciate to any extent during the first 48 hours, after which the glucose content began to increase rapidly until the tenth day, when it had increased almost twenty times as much as in the original. The loss in weight of cane and in the purity of the juice was also considerable.

Planting sprouted cane cuttings, J. SCHURR (*Arch. Suikerindus. Nederland. Ind.*, 23 (1915), No. 12, pp. 461-466; *Meded. Procstat. Java-Suikerindus.*, 5 (1915), No. 5, pp. 178-182).—This article describes the method of planting sugar cane with cuttings in which the buds have made some growth, as distinguished from the usual method of using cuttings in which the buds have not yet started. Directions are given for the production of cuttings and for handling, treating, and planting them.

Sweet potato culture for the southern planter, C. CROW and C. W. WASHINGTON (Seville, Ga.: Crow & Brogdon, 1915, pp. 103, pls. 12, fig. 1).—A popular treatise on sweet potato culture, including descriptions of the various phases of the work and devoting a chapter to commercial sweet potato plant growing in Florida.

Timothy: Its history, culture, and variability, and breeding work carried on with the plant at Svalöf, H. WIRRE (*Sveriges Utsädesför. Tidskr.*, 25 (1915), Nos. 1, pp. 23-44; 4, pp. 143-182; 5, pp. 199-221, figs. 26).—This article presents historical and cultural notes regarding timothy, reviews breeding work with the plant carried on in different countries, discusses its different forms, describes the technique and the method employed at Svalöf in breeding perennial grasses, particularly timothy, and reports results secured together with deductions drawn from them. It is pointed out that since timothy is cross-fertilized and is also very variable, it is impracticable to base its improvement on the selection of homozygous individuals.

In the breeding work it was found that in length of stem the plants varied from 20 cm. to over 100 cm. The heritability of the length of stem was indicated by the experimental results. The number of internodes varied only from 5 to 7 but in length the internodes showed great variations. In some forms the upper internode constituted more than half and in others only one-fourth of the stem length. The lower internodes were quite short in some cases and in others comparatively long. The thickness of stem varied for the different forms but no correlation with the length of stem was established. The shape or form of the stem was found to vary to a considerable extent and appeared to be a heritable character.

Most forms showed a habit of stooling densely, but some stooled quite loosely due to the development of culms from the leaf axils of the preceding generation of sprouts. The leaves varied in length and width and also in shape, some forms having soft and pendant blades while in others the blades were stiff and erect.

The spike in the different strains ranged in length from about 2 to 15 cm. and in thickness from approximately 4 to 10 mm. Correlation between length and width of spike and between length of spike and stem was not established. The spike was generally cylindrical but forms with the greatest diameter either at the base, the point, or the middle were found. In some forms the spike was loose and pendant, while in most cases it was stiff and erect with the spikelets densely set. The spikelets in certain strains were not entirely united with the central axis of the spike, which gave to the head a rough or minutely branched appearance. This also proved to be a heritable character, but the author points out that from a practical standpoint the length and density of the spike are mainly of value.

The floral parts and the fruit also presented many variations. At Svalöf no differences in winter resistance were observed but in the extreme northern part of Sweden marked differences in this respect were found to exist. Variations were also determined in regard to sprouting, time of blossoming, strength of culm, time of withering of leaves, quantity and quality of seed, growth, rust and drought resistance, and the length of the period of productivity. The degree of adherence of the glumes to the ripe seed varied with the different forms and the practical bearing of this character is dwelt upon. The characters of strains of timothy requisite for profitable temporary and permanent meadows, and for satisfactory seed and forage production, are enumerated.

The results of tests with new strains of timothy showed that No. 237a, or Primus, produced a yield 16.7 per cent greater than commercial sorts, while No. 217 yielded 6.7 per cent more than Primus.

Tobacco seed beds, F. CHARLAN (*Canada Expt. Farms Bul.* 21, 2. ser. (1915), pp. 51, pls. 3, figs. 13).—This bulletin is a popular treatise on the preparation, care, and management of tobacco seed beds. Detailed temperature records of hotbeds, semi-hotbeds, and greenhouses are appended.

On the inheritance of some characters in wheat, H. A. and G. L. C. HOWARD (*Mem. Dept. Agr. India, Bot. Ser.*, 7 (1915), No. 8, pp. 273-285, pls. 9).—In previous work along this line (E. S. R., 28, p. 639), it was assumed in view of the results secured that in the crosses between bearded and beardless wheats the bearded parent had two factors, one capable of producing short awns or tips only and the other, when acting in conjunction with the first, resulting in fully bearded plants. To obtain further data on the subject the cross was continued to the F_2 generation, in which the behavior of selected plants confirmed the results of the third generation. The forms with long tips and short tips as well as the bearded and beardless plants bred true.

For the further study of these factors short-tipped and long-tipped forms selected from the F_1 of a cross between P 22, containing the two factors producing the fully bearded character, and A 88 (entirely beardless) were recombined, and P 6, a wheat apparently carrying the long-tipped factor, was crossed with F 7 which seemed to have short tips. In the recombination of the bearding factors of P 22, the F_2 plants were almost beardless while 59 plants in the F_2 ranged from 4 beardless to 4 fully bearded. In the cross of P 6 with P 7 the procedure was the same and the results were similar.

Two other cases of a cross between a bearded and a good beardless form were studied. Punjab Type 9, a bearded wheat, was crossed with Pusa 4, an entirely beardless form, and in the F_2 , 610 plants were examined. Of these, 39 were beardless and 571 were awned to varying degrees ranging from fully bearded to minutely tipped. Similar results were obtained in crossing BNI 77, a fully bearded form, with Pusa 4. The ratio of bearded to beardless forms is regarded as indicating the existence of two factors in the bearded parent.

It was observed that the development of a bearded or beardless character was always uniform, especially in the case of cultures breeding true to long or short tips. The first formed and largest ears had the longest awns, while those which developed later had almost no awns. It is stated that well-grown cultures develop tips normally and present no difficulty in deciding whether the tips are long or short, while in weaker growth the tips do not develop well and care is necessary to distinguish their nature. It is further found that observations on bearding are best made when the ears are still green and just before the chaff begins to change in color. In order to grow complete cultures from any particular plant it is advised to sow the grain in boxes and then transplant the seedlings into the field, as in this way little or no loss of plants occurs.

Studies were also made of felted and smooth chaffs as heritable characters. A microscopical study of the chaff of Punjab Type 9 revealed long silky hairs and much shorter ones. An analysis of the F_2 and subsequently of the F_3 generation resulted in the isolation of these two kinds of hairs and in the proof that each kind is inherited separately. Three crosses were made which resulted in the proof that the felting in Pusa 4 is identical with that in BNI 77 and that the felting in both these cases is identical with the short chaff hair character in Punjab Type 9.

Some observations on the occurrence of sterile spikelets in wheat, A. E. GRANTHAM (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 6, pp. 235-250, pl. 1; also in *Science*, n. ser., 43 (1916), No. 1104, pp. 289, 290).—The results of an examination of a large number of varieties of wheat with reference to sterility of spikelets made at the Delaware Experiment Station in 1915 is noted.

It was found that the varieties grown under field conditions exhibited a higher percentage of sterile spikelets than where the plants were grown 6 in. apart each way as under the centgener method. The average number of sterile spikelets in 25 spikes of each variety and the percentage to the whole number of spikelets were determined for 80 beardless and 108 bearded varieties of wheat. The average percentage of sterile spikelets in the bearded varieties was found to be 24.1 per cent, while the beardless averaged 17.8 per cent. Only 20 of the 80 beardless varieties had more than 15 per cent of sterile spikelets, while not a single variety of bearded wheat had less than 17 per cent. Forty-five of the 108 bearded varieties had 25 per cent or more sterile spikelets, while of the 80 beardless varieties only 2 had 25 per cent.

A study of a bearded and a beardless variety planted at 7-day intervals from September 17 to October 22 on fertilized and unfertilized soil showed that the earlier planting, regardless of soil fertilization, had a higher percentage of sterile spikelets than the later seeding. In this case also the bearded variety had the higher percentage of sterile spikelets.

Two varieties of wheat fertilized with different combinations and quantities of plant food exhibited considerable variation in the sterility of the spikelets. Phosphoric acid and potash used singly developed a higher percentage of sterile spikelets than nitrogen where two of the plant-food elements were used in combination. Nitrogen and potash showed the smallest percentage and phosphoric acid and potash the highest. The untreated plots were comparatively very low in the percentage of sterile spikelets produced.

Correlation studies indicated that the longer the spike the greater the number of sterile spikelets is likely to be.

HORTICULTURE.

Horticultural investigations.—A retrospect, L. C. CORBETT (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 64-70).—A short retrospect of horticultural investigations in the United States. The various lines of endeavor are grouped into the following general classes and discussed: Theoretical considerations, systematic studies of horticultural groups, variety tests, descriptive expositions, surveys of a statistical or economic nature, and special industrial problems.

Some problems connected with killing by low temperature. W. H. CHAPMAN (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 56-63).—A discussion of the cause and nature of killing of plant tissue by low temperature, with special reference to injury to fruit trees. A bibliography of cited literature is included.

Hotbeds and cold frames. C. S. ADAMS (*Kentucky Sta. Circ.* 11 (1916), pp. 3-22, figs. 13).—Popular directions are given for the construction and management of hotbeds and cold frames.

Spraying calendar. E. P. TAYLOR and M. A. WILLIS (*Idaho Sta. Circ.* 1 (1916) folio).—This calendar contains directions for the control of the more important insect pests and plant diseases, together with formulas for the preparation of the principal sprays.

The farm vegetable garden. A. G. B. BOUQUET (*Oregon Sta., Rien. Rpt. Hot River Sta.*, 1913-14, pp. 33-39).—Practical suggestions are given for the construction and management of a hotbed, together with suggestions relative to the production of various vegetables including varieties recommended for general use and for canning.

Preliminary report on celery storage investigations. H. C. THOMPSON (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 19-18).—A test of different types of crates as influencing the keeping quality of stored celery indicates that in order to lengthen the storage period for celery it is desirable either to use crates made

narrower than the standard crates or to furnish a ventilating partition through the center of the standard crates. The narrow crates gave somewhat better results as to keeping quality than the ventilated crates. The limit of keeping quality for celery packed in standard crates and stored under the best conditions is given as 2.5 or 3 months, as compared with at least 4 months for the small or ventilated crates. Aside from their superiority as regards keeping quality small crates are also recommended because of their ease of handling and greater durability in transportation.

Temperature readings taken in five cars of celery en route to market show that there is quite a difference in temperature at different heights in the car, both in the ends and in the center. There is also quite a difference in temperature between the ends and center of the car and between the air and celery temperature at the same location. The temperature records are so similar to those secured with fruit in transit that the author believes precooling will prove just as valuable in preventing decay in the shipment of vegetables as in the shipment of fruit.

The temperature records secured during the past two years and observations in a large number of storage houses during the past three years have led the author to conclude that celery is never inactive while in storage. Normal maturing processes go on in storage even at a temperature of 31 or 32° until the celery is ripe. Decomposition then commences and never stops until the celery is completely decomposed. Where the temperature is maintained between 30 and 32° the rate of ripening and decomposition is slow. With higher temperatures or with fluctuating temperatures the storage period is much shorter.

Fertilizer experiments with kale. T. C. JOHNSON (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 18-24).—A progress report on experiments under way at the Virginia Truck Experiment Station (E. S. R., 30, p. 532) to determine the best methods of treating truck lands in the vicinity to maintain their fertility.

An investigation in tomato breeding. F. S. KREVES (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 24-26).—A brief statement of results secured the first year in an attempt to cross the tomato with *Solanum balbisti* to get a frost-resistant tomato suitable for conditions in Ontario.

Study of the inheritance of size and productiveness in pedigreed strains of tomatoes. C. E. MYERS (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 26-33).—Initial selections from a number of varieties of tomatoes were made in 1911 with the view of studying the inheritance of size and productiveness. The present paper comprises a study by the statistical method of a number of plant selections within the variety Earliana. Although the experiment has not been conducted sufficiently long to warrant definite conclusions, it is believed that the data presented indicate the feasibility of improving the tomato crop by careful selection.

See also a previous note (E. S. R., 34, p. 146).

Horticultural investigations. C. I. LEWIS (*Oregon Sta., Bion. Rpt. Hood River Sta.*, 1913-14, pp. 25-33).—Notes are given on some orchard fertilizer experiments in which the ingredients are being applied both in the dry form and in solution. No definite conclusions are drawn from the results, which represent only one year's work. The data thus far secured indicate, however, that orchard trees may be benefited by spraying with certain fertilizer solutions. In one experiment, here noted, spraying with a solution of nitrate of soda and caustic soda resulted in a better color of foliage, as well as a better growth of fruit and wood, than on plats where nitrate of soda was broadcasted dry or sprayed on the ground in solution. An increased yield of fruit and a decrease in the number of the smaller apples were also observed on the trees sprayed with

the solution. The increase in size of the apples was accompanied by an apparent dropping off in color.

Experiments have been conducted for three years, in which alfalfa and clover were grown as orchard shade crops. The results thus far secured, although not decisive, suggest that where irrigation is done well and a sufficient amount of moisture is maintained in the soil trees will improve in vigor where alfalfa or clover is grown among them. On the other hand, in the absence of sufficient moisture the shade crops will use the moisture at the expense of the trees.

Further results with dynamite for tree planting, A. J. FARLEY (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 127-130).—The author gives additional data secured in planting apple and peach trees with dynamite (E. S. R., 32, p. 535), together with the results secured from planting pear trees with dynamite.

Summing up the results secured during the past three years, it is found that with peach trees planted at Vineland by the use of dynamite there has been a noticeable advantage in the amount of branch and twig development over trees set in the usual manner. With the exception of the first season there has been a corresponding advantage in the circumference of the trees. A similar advantage in branch and trunk development of peach trees planted with dynamite at New Brunswick observed during the first season has not been maintained during the second and third seasons. On the contrary, the advantage is now in favor of the undynamited trees. The only variety producing a profitable crop during the third summer was the Caruan. The crop of this variety showed sufficient increase in favor of dynamiting to be worth more than enough to pay for the cost of the dynamite used in planting. This was not true in the case of the varieties Stump and Elberta.

The difference in twig and trunk circumference has not been so great with apple trees as with peach trees. Pear trees after two years' growth showed a slight advantage in favor of dynamiting. Trees planted with dynamite have developed a deeper root system than trees planted by ordinary methods. The cost of planting trees with dynamite was from 4 to 5 cts. per tree greater than the cost of ordinary planting.

Summing up the experiments as a whole, it is concluded that in the majority of cases the increased growth and fruit production recorded on dynamited trees is not great enough to make up for the increased cost and danger involved in planting. The use of dynamite is not recommended for tree planting on these soils that are naturally adapted to orcharding.

Report of committee on score cards, W. H. ALDERMAN (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 43-52).—The present report represents the findings of the committee on score cards of the Society of Horticultural Science, with special reference to ideal sizes for exhibition purposes for the several varieties of apples grown in the United States and Canada.

The study of apple tree characters and its bearing on variety substitution, J. K. SHAW (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 120-127).—This comprises a brief survey of some of the tree characters of apples that are of value in identifying varieties, together with descriptions of a number of varieties of apples intended to apply to trees from the age of two to five or six years as they appear during late summer or early fall.

Factors correlated with hardness in the apple, F. W. ALLEN (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 130-137).—The author reports studies of twigs representing varieties from several sections of the United States and Canada, but chiefly from a small nursery planted for this purpose on the Iowa Experiment Station grounds. About 33 varieties were included in the test.

Observations made relative to the factors of maturity and water content show that the hardest varieties mature their wood from a few days to several

weeks ahead of the less hardy sorts. The hardier varieties function during the growing season with a smaller amount of water in their tissues. During a spell of very severe weather they retain their more concentrated cell sap and are not dried out so readily by the continued cold. By taking notes on maturity and making tests to determine the rate of transpiration and the freezing point of the cell sap, the author believes that a pretty accurate idea of the tree's hardiness can be obtained.

Studies of the structure and composition of the wood suggest that there is some correlation between the thickness and structure of the bark and the rate of evaporation, although the figures obtained from a large number of examinations are not conclusive. In some cases the maximum thickness of the bark of the more tender varieties exceeded the minimum thickness of bark of the hardier varieties. The amount of stored food contained in the twigs appeared to bear some relation to hardiness, although exceptions were noted. Observations relative to the size of the blossoms indicate that none of the varieties possessing large size and thickness of petals is tender. On the other hand, hardy varieties do not always have the thickest petals. Tests made relative to density of wood, although not conclusive, indicate that there is some correlation between density and hardiness.

Freezing tests were conducted to determine, if possible, the temperature at which the various varieties would be injured under a given condition and also to determine the relation between the moisture content and the ability of the twig to withstand cold. The results secured with a number of varieties are given. In general the twigs were found to be either killed or seriously injured when suddenly subjected to a very low temperature, even though it was for a short time. A longer period of moderate cold slightly injured the hardier varieties and killed most of the tender varieties.

The relation of climate to varieties of apples. R. M. WISSLAU (*Proc. Soc. Hort. Sci., 11 (1914), pp. 137-148*).—The author presents data showing the main features of the growing seasons of different sections of British Columbia, including temperature and rainfall observations and notes on the adaptability of some more important varieties of apples to climatic conditions in the different sections.

A preliminary consideration of one phase of meteorological influence on plants, indicated by hand pollination of several commercial varieties of apples. W. F. FLETCHER (*Proc. Soc. Hort. Sci., 11 (1914), pp. 116-119*).—During a five-year period, 1905 to 1910, the author conducted hand pollination tests in an orchard in the Shuswap Valley with several commercial varieties of apples in different combinations of meteorological conditions. The results from this work led him to the following conclusions, which are here presented to indicate a line of research which has received little attention:

"The sterility or fertility of apple blossoms depends largely upon local conditions. In this statement due allowance is made for the tendencies of different varieties toward light or heavy crop setting character or productivity. The ability between two varieties is governed by local conditions immediately antecedent on pollination. Periods of rapid evaporation, that is, high temperatures, strong winds, and dry air at the time of receptivity of the stigmas are detrimental to the setting of fruit. The shock or the effect of undue exposure to the pistils previous to their natural opening or at the time of receptivity is so great and varies so much under slight changes of atmospheric conditions as to negative all comparative work in hand-manipulated cross pollination."

Osmotic relationships and incipient drying with apples. W. H. CHANDLER (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 112-116).—The results are given of some preliminary experiments conducted by the author and A. J. Heinicke relative to incipient drying of both leaves and fruit of the apple.

The data secured show a fairly large incipient drying in the leaves of apples and an appreciable incipient drying in the fruit. The incipient drying shows earlier with the leaves than with the fruit, and the leaves recover moisture under favorable conditions much faster than the fruit. Moisture determinations of detached and attached fruits show conclusively that the loss of water from the fruits was due to its being drawn from the fruits toward the leaves rather than to evaporation. Although the author does not consider the effect of large leaf surface in drawing water from the fruits at times to be a determining factor so far as size of fruit is concerned, it is suggested that this effect may enter as one of the many possible sources of error in the interpretation of experiments dealing with orchard culture problems.

Experimental results in young orchards in Pennsylvania. J. P. STEWART (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 101-111).—The substance of this paper has appeared in a subsequent bulletin of the Pennsylvania Experiment Station (*E. S. R.*, 33, p. 238).

A fertilizer experiment with peaches. C. A. MCCUR (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 86-91).—A progress report on a long-time experiment with peaches being conducted at the Delaware Experiment Station to determine the effect of certain plant food elements upon the physiology of the tree. At the time of this report the experiment had been running for seven years.

Observations that have been made of the effect of different fertilizing elements upon color of fruit led to the tentative conclusion that any effect of nitrogen, potash, or phosphoric acid upon color is secondary. For example, the deficiency in color in plats heavily fertilized with nitrogen is attributed to the profuse growth of foliage shutting off the light rather than to the direct effect of the nitrogen. The potash plats had practically the same intensity of color as the check plat. Heavy applications of phosphoric acid appear to have a somewhat deadening effect upon color without decreasing the actual amount of color. Trees that were treated with nitrogen or combinations of nitrogen and potash are characterized by their general thriftiness.

Tests thus far made with reference to the keeping quality of the fruit from the various plats indicate that potash has some beneficial effect in increasing the period of soundness of the fruit. Heavy phosphoric acid applications delayed ripening about two days and potash hastened it one day. Nitrogen either in combination or alone delayed ripening from a week to ten days. With combinations of nitrogen and potash the retarding effect of the nitrogen is diminished. Observations thus far made do not show any effect of fertilizers on the time of blooming. The results relative to the effect of fertilizers upon the time of wood ripening in the fall are inconclusive but indicate, contrary to common opinion, that heavy applications of nitrogenous fertilizers do not make a soft immature wood. It is suggested that the regulation of the soil moisture has a more intimate connection with fall ripening of wood and bud than does plant food. As in the case of color of fruit, light appears to be the most important factor influencing the color of twigs. Although no definite conclusion can be made at this time, tests made for several years of pollen from the various fertilizer plats suggest that plant food does have an effect upon the viability and longevity of the pollen.

Data are given showing the calculated yields per acre from the different plats during the three years, 1912 to 1914. Heavy applications of nitrate of soda have been beneficial to fruit production. Still better results have been

secured where potash was combined with nitrogen. Records of costs and receipts from the various plats show in brief that the larger the amount of nitrogen used per acre the greater were the financial returns upon the investment.

The effect of certain mineral fertilizers upon strength of wood in the peach tree. C. A. McCue (*Proc. Soc. Hort. Sci.*, 12 (1915), pp. 113-118).—In connection with the above noted experiment tests were made to determine the effect of certain plant food elements upon strength of wood in peach trees.

The results thus far secured have failed to throw very much light upon the influence of nitrogen, potash, and phosphoric acid in strengthening or weakening wood structures. Almost as much variation was found in the strength of wood from any one block of trees as in the averages for the different blocks. The author is of the opinion that even greater differences in strength of wood can be obtained by different pruning methods than were obtained by different fertilizer treatments.

Methods and results in grape breeding. R. D. ANTHONY (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 81-86).—The author discusses some of the points observed in the course of breeding investigations conducted by various investigators during the past 25 years at the New York State Station and summarizes some of the more important results secured in these investigations. The results of the work have been similarly summarized in a paper previously noted (E. S. R., 32, p. 641).

Recent work with *Vitis vinifera* in New York. U. P. HADRICK (*Proc. Soc. Hort. Sci.*, 11 (1914), pp. 77-81).—Experiments started at the New York State Station in 1911 with 101 varieties of European grapes have shown that many varieties of the European grape can be grown in the eastern United States, provided they are grafted on phylloxera-resistant stocks and given winter protection.

Two methods have been employed in protecting the grapes. In one the vines have been covered with a few inches of earth; in the other the vines have been wrapped with straw. The earth covering was the cheapest and most efficient method.

Of 55 varieties of *V. vinifera* now fruiting on the station grounds a considerable number are here listed as worth trying on a larger scale. In view of the larger yields secured from European grapes as compared with our native grapes, attention is called to the desirability of carrying on experiments with special reference to the cultural requirements of *V. vinifera* in eastern America.

Growing and grafting olive seedlings (*California Sta. Bul.* 268 (1916), pp. 363-326, figs. 14).—This bulletin consists of two parts.

1. *Growing olive seedlings.* P. T. Bioletti and W. F. Oglesby (pp. 305-321).—The results are given of experiments conducted to determine a method of separating good seed from poor, the best preliminary treatment of seed to facilitate germination, and the best conditions of planting to promote quick and uniform establishment. Most of the germination tests were made with the Redding variety. Based on the results as a whole, a simple and rapid method of raising seedling seedlings for grafting stock is recommended in substance as follows:

The perfectly ripe fruit should be soaked in a 3 or 4 per cent soda lye for several hours to soften the skin. After washing off the lye the pulp can be removed by rubbing through a wire sieve of $\frac{1}{8}$ in. mesh. The clean seed is placed in a 25 per cent brine solution and all floating seed rejected.

Of various methods tested for facilitating germination clipping the apex or pointed end of the seed has given the best results. This is done with a clipper specially designed to prevent injury to the seed. The clipped seed is planted

about 0.125 to 0.25 in. deep directly in flats containing a light porous soil, the surface of the soil being covered with a light layer of sifted moss or similar material.

The planted flats are watered only sufficiently to prevent a complete drying out of the layer around the seed. The warmer they are kept the more rapidly the seed will germinate and grow. Some of the seedlings come up in four or five weeks, others continue to come up for two, three, or more months. The seedlings are transplanted into beds at the end of about five months, or when they are about 4 or 5 in. high.

The potted seedlings are kept in a greenhouse, lath house, or other protected place until the following spring when they can be planted in the nursery. They may be budded in the autumn or grafted the next spring.

II. *Grafting olive seedlings*. F. T. Bioletti and P. C. H. Flossfeder (pp. 322-326).—The results are given of experiments conducted to determine a good method of tying, waxing, and covering nursery grafts. The method giving the best results consisted in tying the grafts with a cotton string without waxing and covering with soil to the top of the scion. When the grafts were covered deeply waxing proved to be detrimental.

Heredity studies with the carnation. C. H. CONNORS (*Proc. Soc. Hort. Sci.* 11 (1914), pp. 95-100, fig. 1).—A discussion of the results secured in the author's breeding work at the New Jersey Experiment Stations.

The work thus far conducted shows "that in crossing a yellow carnation with white, red being present as a latent character, white is dominant over yellow and red. In the second generation, yellow will be dominant over red unless the red be strongly evidenced, in which case red is dominant over yellow. In some yellow carnations the presence of red is associated with the presence of perfect sexual organs. The probability of two kinds of white, homozygous and heterozygous, as dominants is strongly suspected."

The humidity factor in rose culture, M. A. BLAKE (*Proc. Soc. Hort. Sci.* 11 (1914), pp. 92-94).—The substance of this paper has been included in a subsequent bulletin of the New Jersey Experiment Stations noted (E. S. R. 34, p. 44).

FORESTRY.

Michigan manual of forestry.—II, *Forest valuation*, F. ROBIT (Ann Arbor, Mich.: Author, 1916, vol. 2, pp. V+171, figs. 7).—The present treatise on forest valuation comprises part 2 of the author's manual and text-book of forestry (E. S. R., 32, p. 46). The introductory chapter discusses the literature, scope, application, and history of valuation. The succeeding chapters treat in detail of the arithmetic of forest valuation, application of valuation, relation of capital and income in forestry, rotation, value of stumpage, damage in timber, taxation of forests, fire insurance in forestry, and right use of land.

Structural timber in the United States, H. S. BETTS and W. B. GIBNEY (*Internat. Engin. Cong.*, 1915, Sept. 29-25, Adv. Copy, pp. 50, pls. 2, figs. 16).—A paper presented at the International Engineering Congress, San Francisco in 1915, in which the author surveys the timber resources of the United States with reference primarily to structural uses. Information regarding the species of particular interest to engineers is presented, together with a summary of the data obtained by the Forest Service of the U. S. Department of Agriculture on their mechanical properties and structural values. A brief reference is also made to grading rules and commercial specifications for structural timbers.

Laboratory tests on the durability of American woods.—I, **Flask tests on conifers**, C. J. HUMPHREY (*Mycologia*, 8 (1916), No. 2, pp. 89-92, pl. 1).—The author reports results of durability tests, extending over periods of 4, 6, and 12 months, of a number of American woods.

The tests were conducted in 2-liter Erlenmeyer flasks, plugged rather lightly with absorbent cotton and capped with thin muslin which had been saturated in a dilute solution of mercuric chlorid. The test blocks were placed in the flask together with "culture blocks" and then inoculated with a culture of *Leptinus tenebrosus*, grown on a bean pod. The "culture blocks" were irregular hemlock blocks introduced as a medium to support a vigorous growth of the fungus in order to secure a uniform and severe infection of the test blocks.

The blocks were weighed before and after the test and the percentage loss calculated from these data.

Preservative treatment of timber, H. F. WEISS and C. H. TEESDALE (*Internat. Engin. Cong.*, 1915, Sept. 20-25, *Adv. Copy*, pp. 45, figs. 3).—This paper, presented at the International Engineering Congress, San Francisco, in 1915, comprises a general review of the results obtained in the United States in preserving wood. A partial bibliography of the subject, covering American practice, is appended.

The properties of balsa wood (*Ochroma lagopus*), R. C. CARPENTER (*Proc. Amer. Soc. Civ. Engin.*, 42 (1916), No. 5, pp. 649-679, figs. 16).—This paper shows the microscopical structure of balsa wood and also gives various tests of its transverse and compressive strength. This wood has been used in the past as a buoyancy product for life preservers and in connection with the fenders of life boats and rafts. The various tests which were made of the insulating properties of this wood indicate that it may prove of value as an insulating material.

Notes on the ancestry of the beech, E. W. BERRY (*Plant World*, 19 (1916), No. 3, pp. 68-77, figs. 2).—A brief historical sketch of the beeches.

British Columbia Douglas fir (*Pseudotsuga taxifolia*) (*Brit. Columbia Govt. Forest Branch Bul.* 14 (1916), pp. 15, figs. 19).—An account of the Douglas fir, with special reference to strength values under different tests as compared with other species of structural timber.

British Columbia western soft pine (*Pinus ponderosa*) (*Brit. Columbia Govt. Forest Branch Bul.* 17 (1916), pp. 15, figs. 17).—An account of this species with reference to its distribution and habit of growth, characteristics, and uses of the wood.

Influence of the intensity of thinnings on the yield of young regular stands of spruce, E. MEA (*Rev. Eau et Forêts*, 54 (1916), No. 2, pp. 45-53).—In continuation of a previous report (E. S. R. 31, p. 444) the author gives the results of thinning experiments started in 1890 in which young spruce stands received thinnings of different intensities with special reference to the effect of the thinnings on yield. The results in general indicate that both early and relatively heavy thinnings act advantageously on future yield.

Manuring experiments on rubber, E. BUSTING (*Agr. Bul. Fed. Malay States*, 4 (1916), No. 5, pp. 125-141).—This comprises a progress report on experiments conducted to determine the influence of different manures on the yield of dry rubber as measured by yield records for a period of 11 months.

The differences thus far are too small to attempt comparative values on the effect of the manures. The use of lime in connection with the different elements has resulted in increased yields, a complete fertilizer to which lime was added giving considerable increase in yield. In addition to yield data records are given of girth increase and cost of manures.

Forest experiments on heath lands, C. DAIGAS (*Hederselsk. Tidskr.*, 1915, Nos. 2, pp. 21-36, figs. 13; 6, pp. 74-90, figs. 14; 8, pp. 101-114, figs. 9).—The results are given of experiments conducted in state and private plantations in the culture of different species of evergreens on heath lands.

Handling the farm woodlot, C. W. EATON (*Univ. Me. Ext. Bul.* 105 (1914), pp. 16, fig. 1).—This bulletin deals primarily with methods of estimating woodlot timber and of selling the timber to greater advantage.

Forest planting in Wisconsin, W. D. BARNARD (*Wis. Conserv. Com. Bul.* 1 (1916), pp. 34, figs. 11).—This bulletin gives an account of the reforestation work accomplished by the State and by private agencies, specific directions for reforesting land, and silvical notes on a number of important species.

Forests of Yosemite, Sequoia, and General Grant National Parks, C. L. MILL (*U. S. Dept. Int., Off. Sec. (Pub.)*, 1916, pp. 39, figs. 22).—A popular descriptive account of forest types and species in these parks.

Treatment of the forests of Mexico, H. BURCEZ (*Dept. Bosques [Mexico]* *Bol. Forest. Propaganda*, 2 (1914), pp. 14, pls. 3).—This bulletin comprises suggestions relative to systems of managing Mexican forests.

Report of the forestry branch, E. J. ZAVITZ (*Rpt. Min. Lands, Forests and Mines, Ontario*, 1915, pp. 69-89, figs. 3).—A report on the operations of the forestry branch of the Province of Ontario for the year ended October 31 1915. Special consideration is given to railway fire protection work.

Reports of the forestry administration for 1914 (*Skogsvårdsförs. Tidskr.* No. 10 (1915), *Bilag.* 2, pp. IV+408 figs. 27).—This comprises reports from the various districts of Sweden relative to the constitution, management, administration, and various operations on the state forests, including a financial statement for the year.

Forest protection laws and suggestions for the development of an adequate law, K. E. KALLIN (*Skogsvårdsförs. Tidskr.*, No. 1 (1916), pp. 1-49, figs. 24).—This comprises a historical sketch of the forest protection laws of Sweden, together with a description of the various forestry districts and suggestions relative to the development and application of an effective forest-protection law.

Progress report of forest administration in the Jammu and Kashmir State for the year 1914-15, W. H. LOVEGROVE (*Rpt. Forest Admin. Jammu and Kashmir [India]*, 1914-15, pp. 11+27+14V).—The usual report relative to the administration and management of the state forests in Jammu and Kashmir, including a financial statement for the year 1914-15. Data relative to alterations in forest areas, various forest operations, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Progress report of forest administration in the Punjab for the year 1914-15, R. MCINTOSH (*Rpt. Forest Admin. Punjab*, 1914-15, pp. 3+20+14V).—A report similar to the above relative to the administration and management of the state forests of the Punjab for the year 1914-15.

DISEASES OF PLANTS.

Miscellaneous pathological projects, H. S. JACKSON and J. R. WYSTER (*Oregon Sta., Bion. Rpt. Hood River Sta.*, 1913-14, pp. 19-24).—Preliminary reports are given on investigations of the so-called winter injury or dieback in apples, apple fruit spots and rots, mushroom root rot of apples and other trees and plants, and general observations on plant diseases.

The so-called winter injury, it is claimed, is not the result of winter conditions, but it seems probable that it has some relation with the soil and moisture conditions. All attempts to isolate an organism have given negative results and it is thought that an improvement in the mechanical and water-holding

capacity of the soil, together with a uniform supply of moisture throughout the year, will prevent the injury.

Under the heading of apple fruit spots and rots, the authors describe bitter pit or dry rot, with which no organism has been definitely associated, Jonathan fruit spot which is said to be a serious disease of the Spitzenberg and other varieties, pink spot of Newtown apples, the cause of which has not been definitely established, and apple-tree anthracnose as a fruit rot. In this case the fungus has been definitely isolated and found to cause both forms of disease.

The mushroom root rot of apples and other trees is said to be quite serious in parts of the Hood River Valley, attacking many varieties of orchard trees and shrubs as well as garden plants. Satisfactory methods of control apparently consist of thorough aeration of the soil about the trees.

Contribution to the study of the parasitic fungi of Colombia, H. and P. Sydow (In *Voyage d'Exploration Scientifique en Colombie*. Neuchâtel: *Mém. Soc. Neuchâtel. Sci. Nat.*, 1914, pp. 432-441, fig. 1).—This list contains the fungi collected by Mayor exclusive of the Uredineae as noted on page 245. Of the 42 species listed, 11 are described as new. One of these is considered to represent a new genus and has received the name *Melanochlamys leucoptera*.

Parasites of cultivated plants in Argentina, L. HAUMAN-MERCK (*Centbl. Bakt. [etc.]*, 2. Abt., 43 (1915), No. 14-16, pp. 420-454).—Besides a discussion of diseases more or less important in Argentina, lists are given of local or more extended causes of injury or diseases of plants, including bacteria, fungi, algae, plasmogamic parasites, and Cuscuta; also lists of such enemies attacking plants according to their groupings as garden, forage, ornamental, industrial, orchard, and forest plants. A bibliography is appended.

Report of the Institute for Phytopathology in Wageningen in 1913, J. RUTZEMA BOS (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen]*, 8 (1915), No. 5, pp. 249-338).—This report deals systematically in some detail with phases of loss in plant industry due to causes of inorganic, parasitic, physiological, or unknown character.

Report on injuries and diseases of cultivated plants in the Rhine Province in 1913, E. SCHAFFNER and G. LÜSTNER (*Veröffentl. Landw. Kammer Rheinprov.*, No. 3 (1915), pp. 69).—This contains reports from Bonn-Poppelsdorf and Geisenheim separately, including, besides sections on the weather and unfavorable agencies nonparasitic in character, accounts of injury or losses due to animals or to cryptogamic parasites attacking economic plants as systematically discussed by classes.

Diseases and enemies of cultivated plants in the Dutch East Indies in 1914, A. A. L. RUTGERS (*Dept. Landb., Nijr. en Handel [Dutch East Indies]*, *Meded. Lab. Plantenziekten*, No. 15 (1915), pp. 45).—This discussion, besides dealing with insect pests of agricultural plants, mentions as appearing here in 1914 for the first time rice smut (*Tilletia horrida*), *Pestalotzia palmarum* on Hevea trunks, and a *Diplodia* attacking the roots of Hevea stumps. Under the names of the various hosts, reports are given regarding diseases affecting a considerable number of agricultural and other plants.

Injury from smoke, late frost, frost drying, and their diagnosis, F. W. NEUBER (*Tharand. Forstl. Jahrb.*, 66 (1915), No. 3, pp. 195-212, fig. 1).—This is an account of observations and experiments regarding leaf injury or loss as related to such factors as light, heat, darkness, fungi, sulphur dioxide, hydrochloric acid, and mechanical injuries.

The occurrence of sulphur dioxide injury to plants in the Selby smoke zone, W. W. JONES (*U. S. Dept. Int., Bur. Mines Bul.* 98 (1915), pp. 398-427, pls. 5).—This report deals mainly with the occurrence of sulphur dioxide injury and of

common fungus diseases, also with such matters as the presence of insect pests, the nature of the soil, and local control methods and practices. Conditions are detailed as said to exist on a number of farms.

Conditions of plant life in the Selby smoke zone, January 1 to July 1, 1914, J. W. BLANKINSHIP (*U. S. Dept. Int., Bur. Mines Bul. 98 (1915), pp. 381-397, pls. 4, fig. 1*).—It is stated that as a rule three kinds of injury to plants may be produced by emanations from smelters, namely, flue dust injury, due to the absorption of poisons from the soil by the roots; acid spot injury to stems, foliage, and fruit, caused by drops of sulphuric acid, usually condensed about small particles of flue dust; and sulphur dioxide injury to foliage, or more rarely to stems or floral parts, due to absorption through the respiratory system or in some instances through the epidermal cells. The conditions for the sulphur dioxide injury, the form most usual in this connection, are more favorable in moist than in dry weather.

The parasitism of seeds and its importance in general biology, V. GALLIPP (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 5, pp. 112-119*).—In this report, with which some discussion is also given, it is claimed that the study of a number of flowers has shown the presence of parasites in the anther, pollen, and stigma, also in the style and ovary, of a considerable proportion of those examined. It is thought that the facts as noted may bear a relation to anomalies of germination percentages and of other kinds.

Crown gall studies showing changes in plant structures due to a changed stimulus. E. F. SMITH (*U. S. Dept. Agr., Jour. Agr. Research, 6 (1916), No. 1, pp. 179-182, pls. 6*).—A preliminary account is given of recent experiments with crown gall in which the author describes the effect of inoculation into the cambium, the fundamental tissue of young stems, the leaf axils of growing plants, and into leaf tissue.

As a result of his investigations the author is led to the conclusion that the immature cell, wherever it is located, carries the inheritance of the whole organism, and that what it will finally become, as it matures, is dependent upon the stimuli withheld from it or applied to it. In other words, the stimulus may be either physiological, resulting in a normal structure, or pathological, resulting in an embryonic teratoma, as when a tumor-producing schizomycete is introduced into sensitive growing tissues.

Horsehair blights, T. PERCEN (*Ann. Roy. Bot. Gard. Peradeniya, 6 (1914), No. 1, pp. 43-68, pls. 6*).—Discussion is given of the characters and habits of *Marasmius equicrinis*, growing only on dead tissues; *M. obscuratus*, apparently also saprophytic; a new species described as *M. coronatus*, not known to be parasitic; and some undetermined species. A fungus which has been considered provisionally as a fructification of an undetermined horsehair blight is described as *Xylaria vagans* n. sp.

The effect of the host on the morphology of certain species of *Gymnosporangium*, B. O. DODGE (*Bul. Torrey Bot. Club, 42 (1915), No. 2, pp. 319-341, pls. 2*).—The author has begun a study of the relation of the particular host to specific differences in the parasite in case of species of *Gymnosporangium* some results from which are tabulated and discussed.

It is considered as possible that *G. fraternum* and *G. bisepalum* may be two distinct species which happen to have ecidia much alike on Amelanchier. The determination of the infection limits of these two species so far as it has been accomplished has raised the questions whether *G. fraternum* on Amelanchier goes back to the cedar as *G. fraternum*, or as *G. bisepalum*, or as both, and whether *G. bisepalum* on Amelanchier goes back to the cedar and reappears as *G. bisepalum*, or as *G. fraternum*, or as both of these forms.

Contribution to the study of the Uredineæ of Colombia, E. MAYOR (In *Voyage d'Exploration Scientifique en Colombie. Neuchâtel: Mem. Soc. Neuchâtel. Sci. Nat.*, 1914, pp. 442-599, figs. 105).—The author lists as having been found in Colombia 158 species belonging to the Uredineæ which are included in 13 genera. Of the 83 species described as new, one is considered to represent a new genus, which has received the name *Chrysocetis lupini*.

Diseases of grains and forage crops, M. T. COOK and J. P. HELYAR (*New Jersey Stat. Circ.* 51 (1915), pp. 3-8).—Descriptions are given of the principal diseases of oats, wheat, corn, barley, alfalfa, and clover, with suggestions for their control.

Control of Fusarium, I. WEIGER (Illus. Landw. Ztg., 35 (1915), No. 53, pp. 351, 352, figs. 4).—Describing experiments testing some fungicides for control of Fusarium on cereals, the author states that the preparations Fusariol and rhizomorfin, as furnished by the Munich Agricultural and Botanic Institute, are found to be remarkably simple, effective, and inexpensive means for control of this fungus on grain intended for seed.

Experiments in control of club root of crucifers, A. NAUMANN (*Flora, K. kais. Gesell. Bot. u. Gartenbau Dresden, Sitzber. u. Abhandl., n. ser.*, 17 (1912-13), pp. 62-78, pl. 1, figs. 3).—An account is given of tests from which good results as regards control of *Plasmidiophora brassicae* were obtained by the employment of a patented preparation. The favorable effects are attributed to the large proportion of lime and the loosening and aeration of the soil due to the addition of mold, without which the good effects of the lime appeared to have been considerably lessened.

Combined fungus attacks on some root crops, J. ERIKSSON (*Ztschr. Pflanzenkrankh.*, 25 (1915), No. 2, pp. 65-71, figs. 5).—The author gives an account of the simultaneous occurrence on kohlrabi of *Fusarium brassicae* and *Pseudomonas campestris*, also on beets of *F. beta* and *Phoma beta*.

Crown gall of alfalfa, J. RITZENH. BOS (*Tijdschr. Plantenziekten*, 20 (1914), No. 4, pp. 107-114, fig. 1).—This is a discussion of the earlier appearances of *Erophysia alfaife* in different countries, the systematic relations and biology of the fungus, and measures for protection against it, including the destruction of affected plants and soil drainage.

Common diseases of beans, M. T. COOK (*New Jersey Stat. Circ.* 50 (1915), pp. 2-4).—Descriptions are given of the more common diseases known to attack the bean together with suggestions for their control.

Yellowing of beets by disease, J. VASTERS (*Landw. Ztschr. Rheinprov.*, 16 (1915), No. 42, pp. 641, 642).—It is stated that over large areas of the Rhine Province both ordinary and sugar beets showed this year premature yellowing of the leaves which was particularly noticeable in certain sections named. Besides animal parasites which had visibly injured the plants in some instances, examination showed the presence of mycelium or spores of *Uromyces betæ*, *Sporidicium (Clasterosporium) putrefaciens*, *Cercospora beticola*, and spores of two fungi, possibly *Phyllosticta betæ* and *P. tabifica*. The plants suffered more or less premature loss of foliage with corresponding decrease of product. The possible bearing of rotation, manuring, and more directly protective measures is discussed.

A bacterial disease of cassava, G. BONDI (*Bol. Agr. [São Paulo]*, 16, ser., No. 6 (1915), pp. 513-524, figs. 4).—A description is given of a serious stem disease of *Manihot palmata*, ascribed to *Bacillus manihotis*, which causes a form of subcortical gummosis, wilting, and, in case of young plants, death in the majority of cases. The disease, it is thought, may be transmitted by insects, also by tools. Of the three varieties of *M. palmata* discussed, one shows considerable resistance while another is very susceptible.

No curative treatment is known. Preventive measures include the use of stock and soil known to be free from the disease, selection of resistant varieties, control of insect parasites, and care in cultural operations to prevent injury to the plants and transference of the organism.

Leaf scorch, scab, and gray mildew of cucumbers. O. APPEL (*Deut. Landw. Presse*, 42 (1915), No. 85, pp. 728, 729, pl. 1).—This contains descriptions of the respective effects on cucumber of *Corynespora melonis*, *Cladosporium cucumerinum*, and *Botrytis cinerea*, with some discussion of conditions and means of their communication. Control measures include the employment of only sound seed with good cultural conditions, and destruction of diseased plants.

Control of *Corynespora*, the cause of leaf scorch of cucumbers. OBERSTEIN (*Illus. Schies. Monatschr. Obst, Gemüse u. Gartenbau*, 4 (1915), No. 4, pp. 41-43, figs. 2).—The author presents some information collected regarding the history, effects, and control of the *Corynespora* disease of cucumbers, the control measures including the avoidance of suspected soil, seed, or plant rubbish, and disinfection of the seed bed with formalin.

A physiological study of certain strains of *Fusarium oxysporum* and *F. trichothecioides* in their causal relation to tuber rot and wilt of *Solanum tuberosum*. G. K. K. LINK (*Abs. in Science, n. ser.*, 43 (1916), No. 1195, p. 338).—The author states that certain strains of these two species of *Fusarium* have produced both tuber rot and wilt of the Irish potato. Wilt is induced by destruction of the root system and by clogging of the xylem elements in the stem, and is, in mild cases, marked by such symptoms as discoloration of the leaves, curling and rolling of the leaves, and production of aerial tubers. Under field and storage conditions, *F. oxysporum* is said to be probably more responsible for wilt than *F. trichothecioides*, while the latter species is more responsible for tuber rotting. The optimum and maximum temperatures of *F. oxysporum* are higher than those of *F. trichothecioides*. On the other hand, *F. trichothecioides* grows well at temperatures of 8 to 10° C. (46.4 to 50° F.), while the other species does not. *F. oxysporum* is considered more cosmopolitan, and it can utilize materials more readily than, but not so completely as, does *F. trichothecioides*.

Effect of certain species of *Fusarium* on the composition of the potato tuber. L. A. HAWKINS (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 5, pp. 183-196).—A report is given of an investigation made to determine the effect of *F. oxysporum* and *F. radicola* on the sucrose, reducing sugar, starch, pentosan, galactan, and crude fiber content of the potato.

It was found that these fungi reduced the content of sugar, both sucrose and reducing sugar, pentosans, galactans, and dry matter. The starch and methyl pentosans were apparently not affected appreciably and the crude fiber content was not reduced. It was found that these two species of fungi secrete sucrose, maltase, xylanase, and diastase, the last-mentioned enzyme apparently being incapable of acting on the ungelatinized potato starch.

Late blight of potato. G. P. DARNELL-SMITH and E. MACKINNON (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 8, pp. 673-678, pls. 2).—Late blight (*Phytophthora infestans*), which became serious in New South Wales in 1909 and widespread in 1910, is said to have been considerably decreased by the dry conditions prevalent in Australia for some years past. The development of the fungus and the progress of the disease are described.

Experimental culture work is said to have shown that the fungus thrives best at 60 to 70° F., no conidia forming at temperatures above 77°, and no further growth of mycelium taking place above 88°. The conidia germinate

readily between 50 and 77°, infecting either the leaves or the tubers. Experiments are said to have shown that the loss through tuber infection is decreased if the digging is postponed for a week or more after the dying of the tops, except in very wet weather and on low, heavy soil, which conditions require early digging. Infected tubers, though capable of spreading the disease, show little or no change, the wet rots sometimes observed being due to the entrance of other organisms.

Control measures include the use of blight-free seed, complete removal of material from the previous crop, rotation, spraying (which is regarded as protective only), and the use of resistant stock. The variety New Era is said to have yielded excellent results since its appearance several years ago.

Biochemical studies on potato leaf roll disease.—V, The amylase of tubers from plants showing leaf roll, G. Doby and J. Bónár (*Ztschr. Pflanzenkrankh.*, 25 (1915), No. 1, pp. 4-16).—The work previously reported on by one of the authors (L. S. R., 28, p. 150) has been extended to a study of the amylase of tubers.

It is thought that the amylase of potatoes is present partly as zymogen, which passes over continually into the active state. The activity in freshly expressed sap showed no relation to the variety or origin of the potatoes tested. In general, sound tubers possess more zymogen than diseased ones.

These studies are not considered as having yet demonstrated a basal chemical criterion for the presence of leaf roll, or as having decided whether the chemical or biochemical changes observed in diseased tubers are the cause or the effect of the disease, or how far the optimum and the activities of amylase differ in sound and in diseased tubers.

Rice smut. A. A. L. Rutgers (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten*, No. 11 (1914), pp. 7, figs. 2).—A description, with bibliography, is given of the grain smut of rice and of the causal fungus (*Ustilidia horrida*), which is considered identical with *T. corona*.

A new brown spot disease of the leaf of *Glycine hispida* caused by *Septoria glycines* n. sp., T. Hemmi (*Trans. Sapporo Nat. Hist. Soc.*, 6 (1915), No. 1, pp. 12-17). The author describes a disease of *G. hispida* characterized by enlarging spots appearing on both surfaces of young leaves, which become discolored and fall, the disease working toward the top of the plants and often ruining the entire crop. The disease, which is due to a fungus described as *S. glycines* n. sp., spreads most rapidly in damp, warm weather and in places which are incompletely drained. In a dry season or place the disease is checked, so that the upper leaves are usually not attacked, but, if the favorable conditions set up, the disease spreads again actively.

The newly described fungus is compared as regards important characters with *S. sojae*, which is said to be the only species previously noted as parasitic on the leaves of soy bean.

Injuries and diseases of tobacco in Dalmatia and Galicia in 1911, 1912, and 1913. PREISECKER (*Facht. Mitt. Österr. Tabakregie*, 15 (1915), No. 1-3, pp. 50-63, fig. 1).—In two sections dealing separately with Dalmatia and Galicia as regards the causation, during this period, of losses to the tobacco interests, notes condensed from official reports are given on plant and animal pests, injuries due to weather, abnormalities of physiological or unknown causation, and diseases caused by fungi in various localities.

The endoconidia of *Thielavia basicola*. W. B. BIERLEY (*Ann. Bot. [London]*, 24 (1915), No. 116, pp. 483-493, pl. 1, fig. 1).—The author gives an account of his study of the conidial characters and behavior in *T. basicola* which are thought to be typical of those in all fungi producing endoconidia.

The first conidium differentiates an inner wall and a sheath which ruptures near its apex, freeing the conidium. Each of the later conidia grow and push out through the empty sheath of the first, being freed from the next below by the splitting of the basal wall which is formed between the two cells by the ingrowth of a basal ring which finally closes in the center.

A bibliography is appended.

Watermelon stem-end rot, F. C. MEIER (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 4, pp. 149-152, pl. 1).—A preliminary report is given on investigations made to determine the cause of a decay of watermelons that has been frequently noted in shipments of those fruits. Material was secured from a shipment received in this city in July, 1915, and an examination showed that more or less injury had occurred in a very uniform manner. In the early stages the presence of decay was indicated by a watery discoloration of the rind in an area closely surrounding and apparently extending from the stem. From this all stages of decay were noted until half or more of the melon was involved. In the later stages the rind portion becomes soft and wrinkled and the flesh below is slimy and blackened.

From the material secured a fungus belonging to the genus *Diplodia* was isolated and inoculation experiments produced typical decay. The specific identity of the fungus has not been determined but inoculations made from a culture of *D. tubericola* produced a decay that took the same course as that described above. Species of *Diplodia* are known to attack a number of economic plants, and the relation of some of these to the watermelon, it is thought, might possibly show whether a species found on one host would grow equally well upon another.

Brown rot of fruit, D. M. CAYLEY (*Gard. Chron.*, 3, ser., 58 (1915), No. 1665, pp. 269, 270, figs. 2).—It is stated that the wet weather of 1915 was probably the cause of the prevalence of *Sclerotinia* (*Monilia*) *fructigena*, causing brown rot of apple and pear. This form is discussed in connection with the closely related forms *S. cinerea* on stone fruits and *S. laxa* on apricots. The mycelium of *S. fructigena* is said to persist in the twigs, branches, spurs, and mummied fruits during the winter and to produce conidia by the time the apple and pear blossoms open. It is said that the fungus may be spread by contact of injured with sound fruits in handling, as the fungus is a wound parasite developing rapidly from very minute injuries.

A Bordeaux spray in early spring before the blossoms open is recommended. Affected parts should be removed and burned during the winter, and rotten apples should be carefully removed in summer.

Experiments for control of apple scab, H. S. JACKSON and J. R. WISSEMER (*Oregon Sta., Bien. Rpt. Hood River Sta., 1913-14, pp. 6-18, figs. 7*).—Results are given of experiments conducted in the Hood River Valley for the control of apple scab, in which lime-sulphur, atomic sulphur, soluble sulphur, and Bordeaux mixture were used separately or in combination with other materials.

As a result of one season's work, the most important application for the prevention of scab proved to be the delayed dormant spray of lime-sulphur and Black Leaf 40. Lime-sulphur was found the most efficient preventive of any one mixture used. Severe fruit injury was often found to follow summer application of lime-sulphur when made just previous to extremely hot weather. It is said that neither atomic nor soluble sulphur can be recommended as a remedy for scab when used in all applications, but good results followed the application of atomic sulphur in the calyx and subsequent applications where lime sulphur had been used in the first application. No appreciable fruit or foliage injury was observed where this method was followed.

The use of lime-sulphur as a summer spray for apple scab, C. C. VINCENT (*Indo Stu. Bul.* 85 (1916), pp. 16, figs. 5).—The results are given of three years' experiments in the use of lime-sulphur as a summer spray for apple scab. The experiments were carried out on the college orchard to ascertain the value of lime-sulphur as a summer spray for scab and to determine the number of applications needed to hold the disease in check. As a result of the work, it is claimed that lime-sulphur is an effective remedy for the control of apple scab, good results being secured during wet as well as dry seasons. The cost of three applications was 8.1 cts. per tree.

In the course of the investigation it was found that different varieties varied in resistance to the disease. Grimes Golden is said to be quite resistant, and one application made at the time the buds were showing pink reduced the fungus attack to a negligible quantity. On the other hand, Wagener, Rome, and Jonathan were subject to attack and neither one nor two applications were sufficient to check the disease completely.

In addition to spraying, the author recommends pruning, cultivation, and fertilization.

The common diseases of the pear, G. W. MARTIN (*New Jersey Stat. Circ.* 52 (1915), pp. 5-12, figs. 6).—The author describes the more common diseases of the pear and gives suggestions for their control. A spray calendar is given, in which time of application, fungicide or insecticide, and the principal causes of injury are indicated.

Apricot disease in the Rhone Valley, P. CHIFFLOY and MASONNAT (*Compt. Rend. Acad. Agr. France*, 1 (1915), No. 15, pp. 473-477).—The report of this outbreak has already been noted (E. S. R., 35, p. 50). *Monilia cinerea* and *M. laxa* have both been claimed to cause the disease.

Brown rot of prunes and cherries in the Pacific Northwest, C. BROOKS and H. E. FISHER (*U. S. Dept. Agr. Bul.* 368 (1916), pp. 10, pls. 3).—The authors report upon an investigation of blossom infection and fruit rot of prunes and cherries, both of which diseases are said to have become quite destructive in parts of Oregon and Washington. The investigation indicates that the trouble is due to *Sclerotinia cinerea*, and spraying experiments have shown the practicability of materially reducing loss from this fungus. The blossom blight was found to be an important factor in the poor set of prune fruit in 1915, and the occurrence of the brown rot on the fruit destroyed a large amount in transit and storage.

As a result of the work with prunes, it was found that both self-boiled lime sulphur and Bordeaux mixture, when properly applied, give satisfactory control. Four applications are recommended, the first just before the blossoms open, the second after the petals have fallen, the third three or four weeks later, with a fourth about four weeks before harvesting.

Blossom infection and fruit rot of cherries due to the same cause have been investigated, and while work with cherries has not been carried out so fully as with prunes, it is thought that a treatment similar to that given for prunes would satisfactorily control the diseases.

Peroid for *Peronospora* on grapevines, F. GVOZDENOVIC (*Stat. Spr. Agr. Bul.* 48 (1915), No. 3, pp. 153-174).—Peroid, three forms of which are prepared as chemical by-products, is said to have shown a considerable degree of efficiency for the control of grape downy mildew.

Citrus bark rot, G. H. ZERNST (*Philippine Agr. Rev. [English Ed.]*, 8 (1915), No. 2, pp. 95-97).—It is stated that since 1911 citrus culture has suffered severely from a bark rot occurring over practically the entire province of

Batangas. The mandarin (*C. nobilis*) appears to be extremely sensitive, the calamondin (*C. mitis*) being less severely injured, and the sweet orange (*C. aurantium*) and the pomelo (*C. decumana*) being seldom affected to a serious degree.

The disease and its results are described. It is supposed to be produced by unfavorable soil and culture conditions, one of the main factors being the packing of the soil, which prevents aeration and drainage. Irregularity of water supply appears to be another factor. Recommendations include proper plowing, varying in depth each year, planting in the rainy season to cover crops, which should be cut and left as a mulch during the dry season, removal of diseased spots, and covering the wounds with lead paint.

Some abnormalities of the coconut palm, T. PERCH (Ann. Roy. Bot. Gard. Peradeniya, 6 (1915), No. 1, pp. 21-30).—The author gives an account of abnormalities which he has noted during the last few years, including yellow coconuts, double coconuts, proliferation, and hypertrophy of the perianth.

The effect of lightning on coconut palms, T. PERCH (Ann. Roy. Bot. Gard. Peradeniya, 6 (1915), No. 1, pp. 31-42).—The author gives collected accounts and his own observations of injuries to coconut palms by lightning in tropical and subtropical regions. The visible effects discussed are combustion of the crown, mechanical injury, and exudation of the gum, often with little or no indication of mechanical injury. The last is thought to be sometimes connected in some way with the heat generated by the electrical discharge.

Black canker of chestnut, L. PERCH (Alpe [Italy], 2. ser., 2 (1915), Nos. 3, pp. 94-99, pl. 1; 5, pp. 188-196, figs. 3).—Discussing the findings and views of others regarding the factors which produce or favor black canker of chestnut, the author describes the phenomena observable in the origin and development of the abnormal conditions associated with the presence of several fungi. He distinguishes between the rapid and quickly fatal attack usual to *Coryneum* and the progress and behavior of the other fungi which commonly precede it as regards the original attack and in some cases possibly furnish the conditions for its rapidly destructive phase. It is stated that frost injuries apparently favor *Coryneum* attack, which, in this case, may be of limited extent.

From a study of the questions whether black rot of the roots precedes or follows the infection of the branches and stem and whether *Coryneum* is able to attack directly the roots and base of the trunk, the author has concluded that, in case of plants just beginning to show disease, the base of the trunk and contiguous portions of the larger roots may be found to show the alterations associated with black rot before *Coryneum* can be demonstrated in the upper portions. The infection of the base of the stem by *Coryneum* may be noted in nursery stock or in chestnuts used as replants where older plants have died with black rot. The initially basal attack by *Coryneum* appears to be limited by the age of the plant. It is said that it may be difficult in an advanced stage of the disease to establish the order of precedence of the two infections, that of *Coryneum* proceeding from above downward and that of other fungi proceeding upward.

The influence of the tannin content of the host plant on *Endothia parasitica* and related species, M. T. COOK and G. W. WILSON (Bot. Gaz., 60 (1915), No. 5, pp. 346-361).—This is a more extended report on investigations the results of which have been noted from another source (E. S. R., 32, p. 640).

The influence of ether on the growth of *Endothia*, M. T. COOK and G. W. WILSON (Bot. Gaz., 60 (1915), No. 5, pp. 412, 413).—The authors, giving results of some studies in connection with those noted above, state that while small quantities of ether in liquid culture media appear to have a stimulating effect

on *E. parasitica*, the use of proportions from 0.2 per cent up retards germination, and the use of those from 0.4 per cent upward results injuriously to the growth of the fungus.

Diseases and injuries of *Hevea brasiliensis* in Java. A. A. L. RUTGERS and K. W. DAMMERMAN (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 10 (1914), pp. 45, pls. 12, fig. 1*).—This is a somewhat systematic discussion of local insect enemies, diseases, and abnormalities of *H. brasiliensis* classified according to portion of the plant attacked, with references under the several sections to related literature. Parasitic fungi named in connection with diseases include, on the roots, *Fomes semitostus*, *Hymenochaete noria*, and *Sphaerostilbe repens*; on the branches, *Corticium salmonicolor* (*C. javanicum*), *Thyridaria tarda*, *Glaeosporium alborubrum*, and *Phyllosticta ranceola*; on the trunk, *Phytophthora fubertii*; and on the leaves, *Phyllosticta hevea* and *Pestalotzia palmarum*. Injurious changes in the latex and prepared rubber are discussed, also such abnormalities as excrescences and fasciations.

The pseudosclerotia of *Lentinus similis* and *L. infundibuliformis*. T. PIERCE (*Ann. Roy. Bot. Gard. Peradeniya, 6 (1915), No. 1, pp. 1-18, pl. 1*).—Reviewing related contributions and describing a study of sclerotia in *Lentinus* found on stumps of *Hevea brasiliensis*, the author states that in addition to species possessing a true sclerotium, there appear to exist others whose mycelium merely binds together the earth in a large compact mass, while *L. similis* and *L. infundibuliformis* exhibit a third type in which the skeleton of the pseudosclerotium consists of the wood of the host plant. It is considered as still an open question whether these types are definitely associated with different species of *Lentinus* or are merely stages which may be assumed by the sclerotium in any given species.

Leaf-spot disease of lime. E. S. SALMON and H. WORMALD (*Gard. Chron., 3, ser., 58 (1915), No. 1500, pp. 193, 194, figs. 2*).—It is stated that a leaf and shoot disease of lime or linden trees near Maidstone in Kent has been identified as *Glaeosporium filicicola*, reported on the Continent by Laubert in 1904 (*E. S. R., 16, p. 988*), but not previously recorded in England. The disease and the habits of the fungus are described.

Infection studies with *Melampsora* on Japanese willows. T. MATSUMOTO (*Trans. Sapporo Nat. Hist. Soc., 6 (1915), No. 1, pp. 22-37, figs. 5*).—Giving an account of morphological, systematic, and infection studies, regarded as being of a preliminary character, on several species of *Melampsora*, the author expresses his belief that a connection exists between the *Melampsora* on *Populus* spp. and the caecoma spores on *Chelidonium majus*, although this could not be definitely settled with the material obtained. It is thought probable that a disease of *Salix caprea* in Japan may be due to the rust fungus which has been designated as *M. larici-europaeum*.

Technical descriptions are given of the new species *M. uccensis* on *S. japonensis* (caecoma stage on *Corydalis ambigua*), *M. larici-miyabeana* on *S. miyabeana* (caecoma on *Larix europaea* and *L. leptolepis*), and *M. larici-opaca* on *S. opaca* (caecoma on *L. europaea* and *L. leptolepis*).

The recent outbreaks of white pine blister rust. P. SPAULDING (*Jour. Wash. Acad. Sci., 6 (1916), No. 4, pp. 102, 103*).—Giving a brief account of white pine blister rust in this country, the author states that in the years 1909 to 1914 there were 11 outbreaks of the disease; that is, cases where it escaped from diseased pines and attacked currant or gooseberry. Owing to favorable weather conditions during 1915, it spread very readily and for relatively long distances. Twelve outbreaks were noted, the extent of attack varying from a few bushes to a single area of from 400 to 500 square miles. It is stated that all of the

species of currant and gooseberry tested thus far have been found to be susceptible, the widely distributed black currant (*Ribes nigrum*) being especially so.

Discussion on decay in timber (*Trans. Canad. Soc. Civ. Engin.*, 29 (July), pt. 1, pp. 324-365, figs. 29).—This discussion, participated in by a number of engineers, deals with the conditions, forms, and results of attacks on various woods, as in mill and other structural timbers, by fungi, more particularly by *Merulius lacrymans*, *Coniophora cerebella*, and *Trametes versatis*, as well as other fungi not yet identified.

Among the more resistant woods heart pine stands very high, as does also wood containing tannin in relation with *Merulius*. Moisture which may condense following a fall in temperature greatly favors attacks in many cases. Air driven from near the surface of warm, moist earth may become saturated and give up moisture in a cooler underground space, wetting the wood instead of drying it. A water pipe may cool surrounding air to saturation and rot adjacent timbers. Certain materials absorb water at high temperatures and give it up at lower temperatures. Hygroscopic salts may form in certain situations or processes. It is thought that *M. lacrymans* may obtain the moisture and oxygen it requires from the wood it decomposes.

A bibliography is appended.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A history of British mammals, G. E. H. BARRETT-HAMILTON and M. A. C. HINTON (*London: Gurney & Jackson, 1915*, [vol. 2], pt. 17, pp. 504-552, pls. 2, figs. 4).—A continuation of the *Muridge of the Rodentia*, previously noted (E. S. R., 34, p. 57) in which descriptions of the field mouse, the Hibernian field mouse, the St. Kilda field mouse, the Fair Isle field mouse, the yellow-necked field mouse, and De Winton's field mouse of the genus *Apodemus* are given and a description of the genus *Micromys* commenced.

Some observations on the rate of digestion in different groups of wild birds, W. E. COLLINGS (*Jour. Econ. Biol.*, 10 (1915), No. 3, pp. 65-68).—Experiments tabulated show that the rate of digestion differs in the rook from that in the English sparrow, and that these two birds and the starling digest the stomach contents in a period of from 4 to 4.5 hours.

A synopsis of the races of the long-tailed goat-sucker, *Caprimulgus macrurus*, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 587-593).

A review of the subspecies of the ruddy kingfisher, *Entomothera cornu-manda*, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 649-657).

Entomological investigations, H. F. WILSON and L. CHUBBS (*Oregon Sta. Bion. Rpt. Hood River Sta., 1913-14*, pp. 40-50).—In studies made of the insects of the Hood River Valley, the codling moth was found to be the most important pest. Observations of this insect made during the period under report indicate the occurrence of a third brood. It is said that during the last two or three weeks prior to harvesting, a large number of young larvae appeared and entered the fruit, causing considerable damage, and that the damage was serious, even in orchards where three spray applications had been previously made.

Statistical data relating to codling moth work in twelve orchards are presented in tabular form for several varieties of apple, showing the extent of damage to the fruit, with various spraying dates, strengths, and combinations of brands. Arsenate of lead in combination with blackleaf 40, lime-sulfur and Bordeaux mixture gave very efficient results.

Observations relative to seasonal history and habits are included. The adults emerge in May and commence to oviposit as soon as the evening temperature rises to 60° F. or above, which condition prevails about June 1. The earliest

larvæ in the spring reach maturity about July 7 to 10, from which time mature larvæ and pupæ can be found until the latter part of July. By August 1 the eggs of the second generation begin to appear, and by August 10 the young larvæ are entering the fruit quite freely. Larvæ and pupæ were found in October, which, it is thought, may have been the third generation of moths, above mentioned, or possibly stragglers from the second generation. Brief reference is made to the control of the codling moth by the two forms of arsenate of lead, a report upon which has been previously noted (E. S. R., 34, p. 548). The second spray should be made at the time the eggs are hatching and the first brood of larvæ are entering the fruit, probably three or four weeks after the calyx or first spray, or about the first or second week in June. The third application, usually given to check the larvæ of the second brood, should be made about six weeks after the second, or from July 25 to August 5. Where a fourth spray is thought desirable for late-appearing larvæ, it should be applied about September 1.

Data relating to a number of minor pests follow. Those thus mentioned are the brown mite, which feeds primarily on clover, alfalfa, and peas, but also occurs on fruit trees and in some instances causes considerable injury; the clubbing or variegated cutworm which bores into the fruit; the fruit-tree leaf-roller, which, though present in the Hood River Valley for a number of years, has only been a source of damage during the past two or three years; the brown apple aphid which has been the source of considerable loss through its injury to the fruit; the woolly apple aphid and the green apple aphid; the pear slug; the San José scale and oyster shell scale; the peach and prune twig miner; and the apple leaf miner.

Proceedings of the Entomological Society of British Columbia, 1915 (*Proc. Ent. Soc. Brit. Columbia, n. ser., No. 7* (1915), pp. 48).—The first part (pp. 21) of this report presents the proceedings of the second midsummer meeting 1914, the second part (pp. 22-45) those of 1915, in continuation of the report previously noted (E. S. R., 34, p. 651).

The following are the more important papers presented: Insect Notes from the Kootenai in 1914, by M. Ruhman (pp. 7-11); The Control of Incipient Infestation of Codling Moth in a New District, by W. H. Lyne (pp. 11-13); Sprays of p-To-Date Interest, by L. L. Palmer (pp. 14-16); The Tarnished Plant Bug (*Lygus pratensis*), by R. C. Treherne (pp. 16-18); The Part Played by Insects in the Spread of Plant Diseases, by J. W. Eastham (pp. 18-21); Insect Pests of Greenhouses, by G. E. Wilkerson (pp. 23-30); Notes on Some Insects of the Fraser Valley, by F. H. Getchell (pp. 30-33); Comments on Some Peculiarities in Connection with the Life History of the Codling Moth on the Pacific Coast, by W. H. Lyne (pp. 33-35); Shade Tree and Ornamental Insects of British Columbia, by R. C. Treherne (pp. 35-41); The Outbreak of Locusts in 1914, by T. Wilson (pp. 41-43); Notes on Birds Likely to be of Service in the Destruction of Grasshoppers in the Nicola Valley, by L. E. Taylor (pp. 43-44); and The Kansas Remedy for the Control of Locusts, by A. Gibson (p. 45). [Economic entomology] (*Ztschr. Angew. Ent.*, 2 (1915), No. 1, pp. 264, figs. 51).—The several papers here presented deal with The Potato Flea-beetle (*Ephedrus affinis*), of which the morphology and biology of the immature stages are considered by F. Tölg (pp. 1-9) and the morphology and bionomics the adult, by F. Heikertinger (pp. 10-28); Flacherie of the Mediterranean Pear Moth (*Ephestia kühniella*) and the Causative Agent, *Bacillus thuringiensis*, sp. n., by E. Berliner (pp. 29-56); Biology of the Tachinids *Parasitigena fregata* and *Panzeria rudis*, by H. Prell (pp. 57-148); Artificial Infestation of the Vine Caterpillars (*Cochytis ambiguella* and *Polychrosis botrana*) by

Parasitic Insects, by K. H. C. Jordan (pp. 149-157); Morphological and Systematic Investigations of the Red Spider (*Tetranychus aufourei*), by I. Träskö (pp. 158-163); and Notes on the Outbreaks of the Klefnerneule (*Panolis pliniperda*) in the Dresden Forest Reserve, by Neumeister (pp. 164-167).

The distribution of California insects, I. E. O. Essig (*Mo. Bul. Conn. Hort. Cal.*, 5 (1916), No. 3, pp. 113-120, figs. 6).—The author considers the distribution of six of the more important insects occurring in California, and presents maps which show the occurrence of each.

Observations on insect pests in Grenada, H. A. BALLOW (*Bul. Ent. Research*, 6 (1915), No. 2, pp. 173-181).—The notes here presented relate to the cacao thrips (*Heliothrips rubrocinctus*), the cacao beetle (*Stiracoma depressum*), the acrobat ant (*Crematogaster* sp.), and the control of scale insects by natural enemies.

The insects of central Europe, especially Germany, edited by C. Schmiedeknecht (*Die Insekten Mitteleuropas insbesondere Deutschlands*. Stuttgart: Francksche Verlagshandlung, 1914, vols. 2, pp. VIII+256, pls. 5, figs. 124; 3, pp. VIII+213, pls. 8, figs. 133).—In the second volume of this work, the first of which is not at hand, the Formicidae are dealt with by H. Stitz (pp. 1-111) and the Ichneumonidae, Braconidae, Chalcididae, etc., by O. Schmiedeknecht (pp. 112-256); and in the third the Cynipidae by J. J. Kieffer (pp. 1-94) and the Tenthredinidae, Cephidae, Siricidae, and Oryssidae by E. Enslin (pp. 95-231). An extensive bibliography and an index to the genera and species accompany each paper. Several colored plates are included.

Manufacturing tests of cotton fumigated with hydrocyanic-acid gas, W. S. DEAN (*U. S. Dept. Agr. Bul.*, 366 (1916), pp. 12).—Spinning and chemical laboratory tests reported indicate that fumigation of cotton with hydrocyanic-acid gas does not affect, to any material extent, the percentages of waste, spinning qualities, tensile strength, bleaching, dyeing, or mercerizing properties of the cotton.

Contribution to the knowledge of olive insects of Eritrea and of South Africa, F. SILVESTRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, (1914-15), pp. 249-334, figs. 78; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 5, pp. 765-768).—A detailed account of observations of insect enemies of *Olea chrysophylla* and *O. europaea* made during the course of excursions in quest of parasites of the olive fly (*Dacus oleae*). Systematic descriptions of many species new to science are accompanied by biological notes.

Forest insects of Sweden, I. TRÄSKÖ (*Svenska Skogsinsekter*. Stockholm: Hugo Gebers, pp. VIII+272, pls. 16, figs. 136; *rev. in Canad. Ent.*, 17 (1915), No. 6, pp. 199, 200).—Following preliminary chapters on the characters and orientation of insects, their development, and general methods of control, the author deals with the different orders, commencing with the Coleoptera, describing those families and their members that are injurious to forests or useful as parasitic or predaceous enemies of forest insects. A special chapter is devoted to gall-making insects and Eriophyes and another to control measures. The work concludes with a table giving keys to the various insects according to the trees and parts of the trees they attack.

Descriptions of a new genus and species of the discodrilid worms, M. J. HALL (*Proc. U. S. Nat. Mus.*, 43 (1915), pp. 187-193, figs. 3).—*Ceratomythyanosomus* collected on crayfish in the streams of Great Basin, Salt Lake City, Utah, is described as representing a new genus and species.

An anatomical note on the genus *Chordeiles*, A. WERMORE (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 175, 176, fig. 1).

White ants in Japan, M. YANO (*Extracts from Bul. Forest Expt. Sta., Tokyo*, 1915, pp. 134-142, pls. 3).—The present paper describes three species of termites which occur in the main island, Shikoku, and Kiushiu, namely, *Leucotermes* (*Reticulitermes*) *speratus*, *Coptotermes formosanus*, and *Calotermes* (*Glyptotermes*) *satsumensis*, including their life history, natural enemies, distribution, and the damage which they cause.

A new *Trichodectes* from the goat, V. L. KELLOGG and S. NAKAYAMA (*Psyche*, 22 (1915), No. 2, pp. 33-35, fig. 1).—The name *Trichodectes hernesi* is given to a species taken from a badly infested young merino goat near Inverness, Marin County, Cal.

Dendrotettix quercus, A. N. CAUDELL (*Psyche*, 22 (1915), No. 2, pp. 52-54).—Considerable damage was done by this species at New Lisbon, N. J., during the season of 1914.

The control of locusts in Italy, A. LUNARDONI (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 4, pp. 522-532, pls. 2).—A summary of control work in Italy.

The question of the bacterial method of controlling locusts, A. V. GRATCHOV (*Zhur. Mikrobiol.*, No. 1-2 (1914), p. 175; *abs. in Rev. Appl. Ent.*, A, 3 (1915), No. 11, pp. 699, 700).—The author suggests the passing of the bacillus (*Coccobacillus acridiorum*) directly from dead insects of one series into those of another without any intermediate cultivation on agar-agar, thus eliminating the danger of losing the virus.

The biological method for the destruction of locusts, F. d'HERELLE (*Compt. rend. Acad. Sci. [Paris]*, 161 (1915), No. 17, pp. 503-505; *abs. in Rev. Appl. Ent.*, Ser. A, 4 (1916), No. 1, pp. 14, 15).—A further report of work with *Coccobacillus acridiorum* (E. S. R., 31, p. 752), which was carried on in Tunis.

A test of *Coccobacillus acridiorum* d'Herelle on locusts in the Philippines, L. A. BARBER and C. R. JONES (*Philippine Jour. Sci., Sect. B*, 10 (1915), No. 2, p. 163-176).—Experiments conducted in the Philippines with *Oedaleus nigrovenosus* and *Locusta migratoroides* in which cultures of *C. acridiorum* from the Pasteur Institute were used gave negative results. Reports received from results in Argentina, Colombia, and Algeria in response to a request for information regarding the results obtained from the use of *C. acridiorum* in those countries are appended. The information given seems to indicate that thus far the use of this organism has not been practical.

Two new Thysanoptera from West Africa, with a note on the synonymy of the Phlebotripidae, J. D. HOOB (*Psyche*, 23 (1916), No. 1, pp. 6-12, pl. 1).

A new vine thrips from Cyprus, R. S. BAGNALL (*Bul. Ent. Research*, 6 (1915), No. 2, pp. 199, 200).—A thrips which is injurious to vines in Cyprus is described as *Cryptothrips brevicollis* n. sp.

The cabbage harlequin bug or calico bug (*Murgantia histrionica*), W. A. THOMAS (*South Carolina Sta. Circ.* 28 (1915), pp. 4, fig. 1).—A brief account with remedial measures.

The immature stages of *Tropidosteptes cardinalis*, M. D. LEONARD (*Psyche*, 23 (1916), No. 1, pp. 1-5, pl. 1).—This capsid was the source of some injury to the leaves of ash at Ithaca, N. Y.

Synoptical keys to the genera of the North American Miridae, E. P. VAN DUXEE (*Univ. Cal. Pubs., Ent.*, 1 (1916), No. 3, pp. 199-216).—The keys here given cover all but eight of the genera of the hemipterous family Miridae thus far recorded from America north of Mexico.

The immature stages of two Hemiptera, *Empoasca obtusa* and *Lopidea whitnii*, M. D. LEONARD (*Ent. News*, 27 (1916), No. 2, pp. 49-53, pls. 2).—Technical descriptions are given of the several stages of these insects.

A psyllid gall on *Juncus* (*Livia maculipennis*), EDITH M. PATCH (*Psytt. 23* (1916), No. 1, pp. 21, 22, pl. 1).—The author records the occurrence of *L. maculipennis* on *Juncus* at Magnolia Village, Mass.

A synopsis of the aphid tribe Pterocommini, H. F. WILSON (*Ann. Ent. Soc. Amer.*, 8 (1915), No. 4, pp. 347-358, figs. 13).—Ten species of this tribe have been described, of which three have been recorded from Europe and five from America. All the known species commonly feed on willows and poplars, and one species is recorded as also being found on maple.

The pea aphid, A. MORDEVILKO (*Trudy Bûro Ent. (Petrograd)*, 8 (1915), 3, 2, rev. and enl. ed., pp. 54, pls. 2, figs. 4; abs. in *Rev. Appl. Ent., Ser. A.*, (1915), No. 11, pp. 702-704).—The second revised and enlarged edition of this paper. The synonymy and a bibliography are appended.

Some intermediates in the Aphididae, A. C. BAKER and W. F. TURNER (*Proc. Ent. Soc. Wash.*, 18 (1916), No. 1, pp. 10-14).

A new genus and species of Aleyrodidae from British Guiana, A. L. QUAINANCE and A. C. BAKER (*Ann. Ent. Soc. Amer.*, 8 (1915), No. 4, pp. 369-371, figs. 18).—*Eudialeurodicus bodkini* n. g. and n. sp., reared from leaves of *Erythrina glauca* at Berbice, is described.

The European fir trunk bark louse (*Chermes* [*Dreyfusia*] *piceæ*) apparently long established in the United States, J. KOTINSKY (*Proc. Ent. Soc. Wash.*, 18 (1916), No. 1, pp. 14-16).—Specimens of balsam fir bark rather heavily infested with this bark louse are said to have been received from Mt. Monanock, N. H. It is stated that the infestation has been spreading during the past three years and that a considerable number of trees have died during that time.

Reports on scale insects, J. H. COMSTOCK (*New York Cornell Sta. Bul.* 32 (1916), pp. 425-603, pls. 26, figs. 15).—This bulletin brings together the author's writings on the Coccidae or scale insects, the first of which (pp. 425-500), entitled Reports on Scale Insects, appeared in the report of the U. S. Commissioner of Agriculture for 1880; the second (pp. 501-506), Report of the Entomologist, United States Department of Agriculture, appeared in the report of the U. S. Commissioner of Agriculture for the years 1881 and 1882; and the third (pp. 507-603), Report of the Department of Entomology, is from the second report of the Cornell Station, 1883. The pagination and the figure number and their sequence in the original reports have been retained.

The Coccidae of New Jersey greenhouses, H. B. WEISS (*Psyche*, 25 (1916), No. 1, pp. 22-24).—The author lists 32 species representing 17 genera found infesting various plants in New Jersey greenhouses.

White wax coccid (*Ericerus pela*), M. YANO (*Extracts from Bul. Forest Expt. Sta., Tokyo, 1915*, pp. 143-150, pls. 2).—The male larvae of this coccid secrete a white wax which is collected and known in commerce as insect wax or Chinese wax. The author gives a description of the several stages of this coccid and an account of its life history, host plants, and natural enemies, namely, *Brachyterus nigrivariegatus*, *Dasyneura* sp., a new chalcid, *Chelonus similis*, and *C. tristis*.

The oyster-shell scale and the scurfy scale, A. L. QUAINANCE and E. R. SASSERER (*U. S. Dept. Agr., Farmers' Bul.* 723 (1916), pp. 14, figs. 31).—A revision of Bureau of Entomology Circular 121, previously noted (*E. S. R.*, 25 p. 156).

The pink corn worm: An insect destructive to corn in the crib, F. H. CHITTENDEN (*U. S. Dept. Agr. Bul.* 363 (1916), pp. 20, pls. 4, figs. 7).—The larva of a small moth (*Batrachodes rilcyi*), known as the pink corn worm, has been found in cornfields of the southern United States for nearly three-fourths of

a century, but not until 1914 was it recognized as a pest. During November and December of that year numerous complaints were made of damage to corn in cribs, especially in Mississippi. The attack begins in the field and continues after the corn has been stored. When the stored ears are husked they show injury by accumulations of webbing and frass or excrementitious matter.

"The eggs are deposited in the field where the tips of the corn ears are more or less open, due to the attack of the corn ear worm. After the latter has departed the pink corn worm continues the injury and by its work makes it easy for other insects and water to enter the ears, which eventually are ruined. From the cob or between the rows of grains the worm penetrates the kernels at the tip or point of attachment, works into the embryo or 'germ,' which it destroys, then outward to the crown.

"Unlike the Angoumois grain moth and the rice weevil, which are usually to be found working in the same fields and frequently in the same ears, this 'worm' does not confine itself to the kernel, but attacks kernel, husk, and cob alike. Also, unlike most other grain pests, it appears to be confined among cereals to corn and sorghum, although it attacks, but does not seriously injure, cotton bolls which are more or less open, and some other plants.

"While thus far it has proved most injurious in Mississippi, it ranges from South Carolina westward to central Texas, southward to tropical Texas, and northward to Arkansas and Tennessee. During the years 1914-15 the pink corn worm was reported to have occasioned very considerable injury, and much alarm was felt because of its abundance in the regions mentioned. Naturally it can not be foretold when, if ever, such an outbreak will recur.

"As a preventive of injury, corn should be left in the field no longer than is absolutely necessary for drying it; the husks should then be removed as soon as possible, the poorest of the infested ears destroyed promptly or fed to swine or poultry, and the best ears fumigated with carbon bisulphid according to the directions given. The bins or cribs should be kept scrupulously clean, and should be fumigated before new material is stored in them. Cooperation among corn growers of as large a territory as possible where the species occurs should be secured that future losses may be prevented."

A bibliography of ten titles is appended.

Notes on large scale experiments against the pink bollworm in cotton seed, G. SENEZAY (*Agr. Jour. Egypt*, 4 (1914), No. 2, pp. 115-124, pls. 2).—These notes describe and report the results of experiments on the hot air treatment and fumigation treatment of cotton seed for the pink bollworm (*Gelechia gossypiella*).

A note on the recent attack of *Brassolis sophoræ*, L. D. CLEARE, JR. (*Jour. Bd. Agr. Brit. Guiana*, 8 (1915), No. 3, pp. 86, 87).—This lepidopteran was the source of considerable injury to coconut palms at Georgetown during 1914, approximately 5 per cent of the palms having succumbed to its attack.

Studies on the vine moths, M. TORI (*Atti R. Acad. Lincei. Rend. Cl. Sci. Fis. Mat. et Nat.*, 5, ser., 24 (1915), I, No. 5, pp. 464-468, fig. 1; also in *Internat. Inst. Agr. (Rome)*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 6, pp. 506-502).—This paper reports further studies (E. S. R., 31, p. 63) made of the bionomics and of control measures for *Cochylis ambiguella* and *Polychrosis botrana*.

Contribution to the knowledge of *Carpocapsa pomonella*, G. SCLARNA (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 10 (1915), pp. 33-50, fig. 1; also in *Riv. Appl. Ent.*, Ser. A, 4 (1916), No. 1, pp. 16, 17).—This reports studies of the bionomics of the codling moth, its economic importance, etc.

Observations of the biology of *Anarsia lineatella*, injurious to the almond, R. SARRA (Bof. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 10 (1915), pp. 51-65, figs. 3; abs. in Rev. Appl. Ent., Ser. A, 4 (1916), No. 1, pp. 17, 18).—The peach twig moth is said to have two generations in Italy, the first appearing in late in May and in June and July, and the second early in September and in October. In addition to almonds it attacks prunes, plums, apricots, and peaches, and has also been recorded on apples.

The fir bud moth (*Argyresthia illuminatella*), I. TRÄGÅRDH (Skogen, 2 (1915), No. 7, pp. 188-191, figs. 2; abs. in Rev. Appl. Ent., Ser. A, 3 (1915), No. 11, p. 697).—*A. illuminatella*, hitherto only recorded from Germany where it sometimes injures fir plantations, is said to be common in Sweden, although it is now recorded as a pest in that country for the first time. The larva attacks the young buds and hibernates therein, pupation taking place in May of the following year and the moths appearing in the latter half of June.

A new coconut palm pest in Java, P. E. KEUCHEMIUS (Centbl. Bakt. [etc.], 2. Abt., 43 (1915), No. 19-24, pp. 692-699, pl. 1).—An account of the pyralid *Metissoblyptus ruficornalis* and its injury to the coconut palm.

The classification of lepidopterous larvæ, S. B. FRACKER (Ill. Biol. Monographs, 2 (1915), No. 1, pp. 169, pls. 10).—The first part of this work (pp. 13-40) relates to the homology of the setæ, and the second or main part (pp. 41-143) consists of a systematic outline of families and genera. A glossary and bibliography are included.

Résumé of work in Peru on *Phlebotomus verrucarum* and its agency in the transmission of verruga, C. H. T. TOWNSEND (An. Zool. Aplicada, 1 (1914), No. 1, pp. 44-64, figs. 24).—This is a summary of the author's investigations of verruga, of which accounts have been noted from other sources (E. S. R. 34 p. 355).

Behavior of *Anopheles albimanus* and *A. tarsimaculata*, J. ZETTER (Ann. Ent. Soc. Amer., 8 (1915), No. 3, pp. 221-271, figs. 6).—This paper is largely a report of definitely observed and demonstrated flights of *A. albimanus* and its racial variety *tarsimaculata*.

"The life cycle of *A. tarsimaculata* was found to be from seven to nine days. Direct observations from boats and on land showed a distinct flight of banks of *A. tarsimaculata* and *A. taeniorhynchus* toward Gatun, beginning at dusk, and lasting about 30 to 45 minutes. There was a return flight from Gatun to the breeding place beginning at early dawn and lasting until objects could be easily discerned, about 30 minutes duration. This return flight takes place higher in the air and is characterized by haste."

The mosquito and its relation to public health work in the Tropics and subtropics, L. E. COOLING (Jour. Roy. Sanit. Inst., 56 (1915), No. 19, pp. 444-454, pls. 2).—This paper includes a table which shows the difference between the more important species of mosquitoes of Brisbane, namely, *stephensi*, *fasciata*, *Culex fatigans*, *Culiseta vigilax*, and *Nyssorhynchus annulipes*, and their various stages.

The Simuliidæ of northern Chile, F. KNAB (An. Zool. Aplicada, 1 (1914), No. 1, pp. 17-22, fig. 1).—Three species are described of which one, *Simulium tenuipes*, is new to science.

The rôle played by the insects of the dipterous family Phoridae in relation to the spread of bacterial infections.—Experiments on *Aphiochaeta ferruginea* with the cholera vibrio, D. N. ROMANA (Philippine Jour. Sci., Ser. 1, 10 (1915), No. 5, pp. 309-336).—The experiments here reported indicate the *A. ferruginea* may serve as a possible porter or carrier of Asiatic cholera.

Notes and descriptions of Pipunculidæ, N. BANKS (*Psyche*, 22 (1915), No. 5, pp. 166-170, pl. 1).—Four species are described as new and 18 species noted as found in Virginia, making a total of 27 pipunculids recorded from that State.

Report on some parasitic and predacious Diptera from northeastern New Mexico, W. R. WALTON (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 171-186, pls. 2).—This annotated list of species collected in connection with an investigation of the New Mexico range caterpillar (*Hemileuca olivæ*) includes descriptions of several species new to science, namely, *Rhynchiodexia flavotessellata* n. sp., at Eagle Tail Mountain; *Zelia wildermuthii* n. sp., at Koehler; *Websteriana costalis* n. g.; and *Neodichocera tridens* n. g. and n. sp., at Koehler, N. Mex.

Nonintentional dispersal of muscoid species by man, with particular reference to tachinid species, C. H. T. TOWNSEND (*Proc. Ent. Soc. Wash.*, 18 (1916), No. 1, pp. 18-20).

New species of Tachinidæ from New England, H. E. SMITH (*Psyche*, 22 (1915), No. 3, pp. 98-102).

[Control of the house fly], R. HULBERT (*North Dakota Sta. Spec. Bul.*, 4 (1916), No. 3, pp. 65-72, figs. 2).—A summary of measures for the control of the house fly.

Does the house fly hibernate as a pupa? H. LYON (*Psyche*, 22 (1915), No. 4, pp. 140, 141).—Experiments were conducted at Harvard University during the winter of 1914-15 to determine if it is possible for the house fly to overwinter in the pupal stage.

"The results of these experiments, which represented quite natural conditions and the especially favorable conditions of the basement of the building, seem to indicate that the house fly can not easily overwinter as a pupa, although it can emerge until the middle of winter. It would seem, therefore, that the appearance of seemingly freshly emerged adults in any considerable numbers during late winter and early spring should be accounted for in some other way."

Will the Mediterranean fruit fly (*Ceratitis capitata*) develop in Italian lemons? G. MARTELLI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 9 (1914), pp. 161-164).—The author fails to find evidence that *C. capitata* will develop in lemons.

The Mediterranean fruit fly (*Ceratitis capitata*) in the environs of Paris, P. LESNE (*Compt. Rend. Acad. Agr. France*, 1 (1915), No. 16, pp. 495-497; *abs. in Rev. Appl. Ent.*, Ser. 1, 3 (1915), No. 11, p. 694).—This fruit fly, first recorded as a source of injury to apricots in the Paris district in 1900 and the source of serious injury to peaches in 1906, was found in October, 1914, to be the source of injury to pears.

Preliminary note on a dipterous enemy of the peach, LEGENDRE (*Bul. Écon. Govt. Gén. Madagascar*, 14 (1914), III-IV, No. 3-4, p. 212; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 6, pp. 800, 804).—The author records the occurrence of the Mediterranean fruit fly in Madagascar.

On the Ethiopian fruit flies of the genus *Dacus*, M. BEZZI (*Bul. Ent. Research*, 6 (1915), No. 2, pp. 85-101, figs. 14).—Twenty species are here considered, of which six are described as new.

New American species of *Asteia* and *Sigaloesa*, J. M. ALDRICH (*Psyche*, 22 (1915), No. 3, pp. 94-98, pls. 2, figs. 2).

The host of *Zelia vertebrata*, J. A. HYSLOP (*Psyche*, 23 (1916), No. 1, pp. 24, 25).—The author records the rearing of this dipteran from *Mercurialis contracta*.

Notes on the cat flea (*Ctenocephalus felis*), H. LYON (*Psyche*, 22 (1915), No. 4, pp. 124-132, pl. 1, figs. 4).—The notes here presented relate to the infestation of 139 cats, the seasonal abundance of the cat flea, the method of raising fleas, observations on the anatomy of the larva, etc.

The rose chafer: A destructive garden and vineyard pest, F. H. CHITTENDEN and A. L. QUAINANCE (*U. S. Dept. Agr., Farmers' Bul. 721* (1916), pp. 8, figs. 4).—This popular account of the rose chafer and methods of control is an enlarged revision of Circular 11 of the Bureau of Entomology.

The cherry leaf beetle, a periodically important enemy of cherries, R. A. CUSHMAN and D. ISELY (*U. S. Dept. Agr. Bul. 352* (1916), pp. 28, pls. 5, figs. 9).—The present studies with *Galerucella cavicollis* were in large part conducted at North East, Pa.; observations made at the New York Cornell Station by Herrick and Matheson have been previously noted (*E. S. R.*, 34, p. 756).

The authors find the pin. fire, or bird cherry (*Prunus pennsylvanica*) to be the natural food plant of this insect. The wild black cherry (*P. serotina*) and chokecherry (*P. virginiana*) are entirely immune from attack, even by the beetles. Among the cultivated fruits only sour cherry and peach trees are attacked, the sweet cherry and plum not being attacked at all.

The outbreak of 1915 is said to have been by far the most injurious that has ever occurred, the damage having been caused throughout two comparatively large regions, the one in the Appalachian region involving the greater part of New York, Pennsylvania, and northern West Virginia; the other in the northern part of lower Michigan, especially in the Grand Traverse region, where cherry growing is very extensive.

In the vicinity of North East, Pa., the beetle appeared on June 7, literally covering the leaves of the trees attacked, the source of the migration having been to the south of the grape belt, from cut-over forest land grown over by pin cherry, the foliage of which had been reduced by a freeze on May 27 and in part of the range by the tent caterpillar also. The beetles gradually disappeared until by the latter part of June practically all had gone, although a few scattering ones were found as late as early August.

The adult feeds almost exclusively on the underside of the leaves, eating small, irregular holes through the lower epidermis and parenchyma and sometimes through the entire leaf. To an extent it feeds also upon the fruit of the cherry, scarring and pitting it. The larvae of all ages feed in a manner similar to the adults on the undersurface, eating through the leaf to the upper epidermis but leaving that intact. The period of economic injury of this beetle extended over 14 or 18 days after its first appearance in June.

Technical descriptions are given of its life stages. Data relating to life history studies of nearly 600 individuals, almost half of which were carried through their entire development from hatching to emergence of the adult insect, are reported upon, much of the data being presented in tabular form. The larvae continued to hatch out as late as August 18 and were observed on pin cherry as late as September 10. The active feeding portion of the larval life in the cages varied from 10 to 20 days, the average being 12.33 days. The period spent in the ground in the cages varied from 14 to 28 days, the average being 22.96 days, and the total developmental period being from 45 to 50 days.

A small carabid beetle (*Lebia ornata*) was found to attack both pupae and chrysalis adults voraciously.

The control experiments conducted are briefly summarized as follows:

"Arsenate of lead must be used at a rate of not less than 5 lbs. to 50 gal. of water to be effective in protecting trees from injury by the cherry leaf beetle. A mixture to which molasses was added at the rate of 1.5 gal. to 50 gal. of the mixture was effective in killing practically all of the beetles which fed upon the

trees on which this mixture was applied. This addition of sweetening to the arsenate has the serious disadvantage of making the spray easily washed off by rains. Arsenate of lead used without molasses was less effective in protecting the trees, although it killed some beetles and it was to an extent repellent to them. Lime in the amount in which it is added to an arsenate-of-lead spray was not repellent.

"Forty per cent nicotine sulphate applied with water at the rate of 1:600, with or without soap, was effective as a contact spray. Weaker dilutions of nicotine sulphate and soap carbolic acid solutions, although apparently effective at the time of application, did not have a permanent effect. . . .

"Sweetened arsenate of lead is recommended for cherry trees because of its efficiency in killing the beetles and because its effect is continuous in favorable weather. Rain destroys the effectiveness of this spray. The combination found most useful is 5 lbs. of arsenate of lead, 1.5 gal. of molasses, and 50 gal. of water."

A bibliography of 25 titles is included.

Hyperaspis binotata, a predatory enemy of the terrapin scale, F. L. SIMAN-ROX (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 5, pp. 197-205, pls. 2, fig. 1).—The economic importance of this coccinellid beetle (*H. binotata*) as an enemy of lecanium scales was impressed upon the author during the course of investigations of the terrapin scale, previously noted (E. S. R., 35, p. 156). The adult beetles do not feed upon the mature scales, but destroy the young and also attack aphids and other soft-bodied insects, being particularly effective in controlling the cottony maple scale and terrapin scale. The beetle occurs in a large part of the territory east of the Mississippi River, being most abundant in the Atlantic States from Connecticut to Maryland, but is common from New Jersey to Illinois, and even extends west of the Mississippi in some States to the semiarid region.

Technical descriptions are given of its life stages. The eggs, which are salmon colored, are deposited singly on twigs adjacent to the host. The life cycle requires 39 days and is as follows: Incubation, 7 days; first instar, 3 days; second instar, 2 days; third instar, 3 days; fourth instar, 12 days; and pupa, 12 days.

Wireworms destructive to cereal and forage crops, J. A. HYSLOP (*U. S. Dept. Agr., Farmers' Bul.* 725 (1916), pp. 10, figs. 6).—This is a general discussion of wireworms and their control based upon the author's investigations, previously noted (E. S. R., 32, p. 555).

Prothetely in the elaterid genus *Melanotus*, J. A. HYSLOP (*Psyche*, 23 (1916), No. 1, pp. 3-8, pls. 2, fig. 1).

Elateridae and Throscidae of the Stanford University expedition of 1911 to Brazil, J. A. HYSLOP (*Psyche*, 23 (1916), No. 1, pp. 16-21, pl. 1, fig. 1).

Observations on the life history of *Meracantha contracta*, J. A. HYSLOP (*Psyche*, 22 (1915), No. 2, pp. 44-48, pl. 1, figs. 2).

Notes on the habits of weevils, W. D. PIERCE (*Proc. Ent. Soc. Wash.*, 18 (1916), No. 1, pp. 6-10).

The buff-colored tomato weevil (*Desiantha nociva*), W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 12, pp. 1065, 1066).—This weevil has a wide range over the eastern and southern coasts of Australia. In New South Wales damages the young buds and shoots of fruit trees and vines in early summer, but was not known as a serious field-crop pest until 1915.

Beekeeping in Wisconsin, N. E. and L. V. FRANK (*Wisconsin Sta. Bul.* 264 (1916), pp. 5-28, figs. 11).—A general account based upon many years' experience, the senior author having been state apiary inspector for a period of 18 years.

Texas beekeeping, L. H. SCHOLT. (*Texas Dept. Agr. Bul.* 24, 2. ed. (1912), pp. 142, figs. 115).—A second edition of this manual (E. S. R., 27, p. 864).

Annual reports of the Bee Keepers' Association of the Province of Ontario, 1913 and 1914 (*Ann. Rpts. Bee Keepers' Assoc. Ontario*, 1913, pp. 72; 1914, pp. 78, fig. 1).—The proceedings of the annual meetings of the association for the years 1913 and 1914.

Horismology of the hymenopterous wing, S. A. ROHWER and A. B. GAHAN (*Proc. Ent. Soc. Wash.*, 13 (1916), No. 1, pp. 20-76, figs. 11).

British ants, their life history and classification, H. St. J. K. DONISTHORPE (*Plymouth, England: William Brendon & Son, Ltd.*, 1915, pp. XT+370, pls. 18, figs. 92; rev. in *Science*, n. ser., 43 (1916), No. 1105, pp. 316-318).—This comprehensive guide to the study of the British ants is based upon the author's twenty years of labor and experience. In the introduction (pp. 3-64) the external and internal structure, life history, psychology, geographical distribution, geological record, collecting, and observation are considered, following which the indigenous genera and species (pp. 65-334) and cosmopolitan and introduced species (pp. 334-350) are dealt with.

A bibliography of 15 pages and a systematic index to British ants and myrmecophiles are appended. The review is by W. M. Wheeler.

Two new species of *Cerceris*, N. BANKS (*Ent. News*, 27 (1916), No. 2, pp. 64, 65).

A revision of the Ichneumonidae based on the collection in the British Museum (Natural History), with descriptions of new genera and species. C. MORLEY (*London: Brit. Mus. Nat. Hist.*, 1915, pt. 4, pp. XII+167, pl. 1).—This fourth part of the work previously noted (E. S. R., 31, p. 656) deals with the tribes Joppides, Banchides, and Aenomyides of the subfamily Ichneumoninae.

Descriptions of six new species of ichneumon flies, R. A. CUSHMAN (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 507-513).—The species here described as new are: *Bassus carpocapsae*, *Aenopler carpocapsae*, *A. plesiotypus*, and *Glypta brevis* reared from the codling moth, at South Acton, Mass., Vienna, Va., Alameda, Cal., and French Creek, W. Va., respectively; *Nalopygus virginianus* from Vienna, Va.; and *Idexthis nigricornis* reared from *Euzophora scintillaria* at Youngstown, N. Y.

Some new chalcidoid Hymenoptera from North and South America, A. A. GIRAUULT (*Ann. Ent. Soc. Amer.*, 8 (1915), No. 3, pp. 272-278).—Four genera, 8 species, and 2 varieties are here described as new. Of these *Eunotus americanus*, reared from *Eriopeltis festuca* at Portland, Me., and *Anagrus armatus nigricornis*, reared from eggs of *Empoasca rosea* at Corvallis, Ore., are of economic importance.

Descriptions of new genera and species, with notes on parasitic Hymenoptera, A. B. GAHAN (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 155-163).—In this paper descriptions are given of three species of Ichneumonoiden and two genera and ten species of Chalcidoidea new to science, including *Hyposoter infectus* reared from *Prodenia ornithogalli* at Arcola, Miss.; *Nepiera brevis* from *Eurygnus erythraea* at Salt Lake, Utah; *Aphareta sarcophaga* from *Sarcophaga kellyi* at Wellington, Kans.; *Liodontomerus perplectus* and *Tetrastichus maculatus* n. g. and n. sp. at Yuma, Ariz.; *Habrocytus mediorum* at Glendale, Cal., and *Tetrastichus venustus* at Corcoran, Cal., from alfalfa seed pods infested with *Brucophagus fovealis*; *Anastatus scutellaris* from *Hemiteuca olivae* at Kochler, N. Mex.; *Euplecterus sarcophaga* from *S. kellyi* at Dodge City, Kans.; *Euplecterus insuetus* from *Lorena acris* at Lathrop, Fla.; *Dialinus insularis* from *Agromyza inaequalis* at Rio Piedras, P. R.; and *Tetrastichus eucetris* from *Euplecterus platyphrenae* at Tallulah, La.

New chalcidoid Hymenoptera, A. A. GIRAULT (*Ann. Ent. Soc. Amer.*, 8 (1915), No. 3, pp. 279-284).—One genus and 8 species are here described as new to science, among which is *Aphidencyrthus aspidioti*, reared from *Aspidiotus perniciosus* at Lansing, Mich. *Coccidencyrthus ensifer* is recorded as reared from *Aspidiotus juglans-regie* at Muskegon, Mich.

Chalcidoidea bred from *Glossina morsitans* in Northern Rhodesia, J. WATERSTON (*Bul. Ent. Research*, 6 (1915), No. 1, pp. 69-82, figs. 5).—Three species representing as many widely separated groups in the superfamily Chalcidoidea are considered, two of which are described as new to science.

Two new Mymaridæ from the eastern United States, A. A. GIRAULT (*Ent. Soc.*, 27 (1916), No. 2, pp. 69, 70).

Notes on some sawfly larvæ belonging to the genus *Dimorphopteryx*, W. MIDDLETON (*Proc. U. S. Nat. Mus.*, 48 (1915), pp. 497-501, pl. 1, figs. 4).—These notes relate to *Dimorphopteryx castanea* on chestnut at Falls Church and Wiehle, Va., and Blythedale, Md.; *D. autumnalis* on red oak at Falls Church and Wiehle, Va.; *D. quercivora* on red oak at Tomahawk Lake, Wis.; and *D. errans* on birch and linden.

Ticks: A monograph of the Ixodoidea.—Bibliography of the Ixodoidea, II, G. H. F. NUTTALL and L. E. ROBINSON (*Cambridge: University Press*, 1915, pp. [4]+32).—This addition to the bibliography previously noted (*E. S. R.*, 25, p. 858) lists 462 papers, a large proportion of which have appeared since the publication of the first part.

Ticks: A monograph of the Ixodoidea, III, The genus *Hæmaphysalis*, G. H. F. NUTTALL and C. WABBLETON (*Cambridge: University Press*, 1915, pp. [11]+549-550, pls. 9, figs. 143).—The authors recognize 50 species and varieties, including the three species *H. spinulosa*, *H. obtusa*, and *H. numidiana*, the validity of which is somewhat doubtful. The synonymy and references relating to publications which deal with the genus *Hæmaphysalis* and the generic characterization are followed by keys for the determination of the species of the genus, including males, females, nymphs, and larvæ, so far as known. Specific descriptions of valid species of the genus and of their varieties, which take up the greater part of the work (pp. 362-506), are followed by an account of the geographical distribution and hosts of the genus; a list of condemned and doubtful species of *Hæmaphysalis*, including their synonymy and literature; notes on the biology of *Hæmaphysalis* (pp. 518-547), by G. H. F. Nuttall; and an index to valid species of the genus, together with a list of collections in which the types are to be found.

The cassava mite, S. LEEFMANS (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten*, No. 14 (1915), pp. 35, pls. 3; *abs. in Rev. Appl. Ent., Ser. A*, 8 (1915), No. 11, p. 632).—The red spider which injures cassava in Java is *Tetranychus bimaculatus* or closely related to it. Stripping and burning the leaves is the only remedial measure thus far found to give satisfactory results.

The leaf blister mite of pear and apple, A. L. QUAINANCE (*U. S. Dept. Agr., Farmers' Bul.* 722 (1916), pp. 6, figs. 4).—A reprint of Bureau of Entomology Circular 154, previously noted (*E. S. R.*, 27, p. 565).

On a widely distributed gamasid mite (*Leiognathus morsitans* n. sp.), parasitic on the domestic fowl, S. HIRST (*Bul. Ent. Research*, 6 (1915), No. 1, pp. 55-58, figs. 3).—*L. morsitans*, here described as new, is said to have a very wide distribution in Africa and also to be found in Mauritius, China, India, and South America. It appears to be the common bloodsucking gamasid mite of poultry in these countries.

On some new acarine parasites of rats, S. HIRST (*Bul. Ent. Research*, 4 (1915), No. 2, pp. 183-190, figs. 8).—Four mites from rats are described for the first time, one being a new species of *Laelaps* which occurs in Ceylon, India, Africa, and South America, while the three others are larval forms of *Trombidium* collected in India.

Two Mexican myrmecophilous mites, N. BANKS (*Psyche*, 22 (1915), No. 2 pp. 60, 61, figs. 2).

FOODS—HUMAN NUTRITION.

The infection of foods by bacteria, M. BERNARD (*Bul. Soc. Vaudo. Sci. Nat.*, 5, ser., 50 (1915), No. 187, pp. 589-619).—Information is given regarding the infection of milk, bread, eggs, meat, and drinks by pathogenic bacteria. The most effective preventive measures are thought to be rigorous inspection of all places where foods are prepared, handled, and sold; protection from insects, especially flies, by suitable screening; and personal inspection.

Feeding experiments with *Bacterium pullorum*.—The toxicity of infected eggs, L. F. RETTGER, T. G. HULL, and W. S. STURGES (*Jour. Expt. Med.*, 22 (1916), No. 4, pp. 475-489).—Earlier work by the senior author (E. S. R., 31, p. 171) on the bacteriology of normal, fresh eggs is referred to and attention is called to the widespread occurrence of *Bacterium pullorum* in eggs and its possible significance in food poisoning.

The investigation here reported consisted of two parts—a study of the toxicity of *B. pullorum* when administered orally, either with food or by means of a pipette, and also an investigation of the heat tolerance of *B. pullorum* in infected eggs which were prepared for edible use by the ordinary processes of boiling, coddling, frying, etc.

Laboratory animals (rabbits, kittens, guinea pigs, and white rats) were fed varying amounts of water suspensions of cultures of several different strains of *B. pullorum*. Post-mortem examinations were made of the animals which died and also of control animals, the results of the experiments being reported in detail.

The results of these tests showed that "eggs which harbor *B. pullorum* in the yolk in large numbers may produce abnormal conditions, when fed, not only in young chicks, but in adult fowls, young rabbits, guinea pigs, and kittens. The toxicity for young rabbits is most pronounced, the infection usually resulting in the death of the animals. In kittens the most prominent symptoms are those of severe food-poisoning with members of the paratyphoid group of bacteria."

Fresh eggs were infected with *B. pullorum* by injecting a small amount of water suspension of the organism into the yolk by means of a sterile hypodermic syringe. The infected eggs were incubated from three to five days and then cooked in different ways, after which they were examined for the presence of the organisms. These tests showed that poaching the eggs for from one-half to four minutes rendered them sterile. Also no visible organisms were recovered from infected eggs which had been scrambled. In the case of fried and coddled eggs the organisms were recovered from the cooked eggs in some cases and not in others. Even boiling the eggs for four minutes did not in every instance destroy the organisms, this resistance being attributed by the authors to the protection afforded by the shell, the egg white, and the yolk itself.

The authors state that the possibility of danger from infection with *B. pullorum* can not be ignored, especially in the case of invalids and young children.

"Ovarian infection of fowls is very common throughout this country. Hence a large proportion of the marketed eggs are infected with *B. pullorum*. When

such eggs are allowed to remain in nests under broody hens or in warm storage places for comparatively few hours they contain large numbers of the organism.

"Soft boiling, coddling, and frying on one side only do not necessarily render the yolks free from viable bacteria; therefore eggs which have gone through these processes may, like raw eggs, be the cause of serious disturbances in persons who are particularly susceptible to such influences, and especially in infants. That no well-authenticated instances of egg poisoning of this kind are on record does not warrant the assumption that there have been no cases. The etiology of infantile stomach and intestinal disturbances is as yet too little understood; in fact, it may be said that many of these disorders have no known cause, and almost as much may be said regarding gastro-intestinal diseases in later life. Furthermore, since the ailments caused by infected eggs would not make themselves felt, presumably, until several days after their ingestion, little or no suspicion would fall upon the eggs. It may be said, too, that the wide distribution of ovarian infection in the domestic fowl has come about only in the last few years, hence its possible danger to man is one of recent development."

Turning green of oysters and their content of heavy metals. F. LIEBERT (*Chem. Weekbl.*, 12 (1915), No. 44, pp. 973-983).—A summary and digest of data concerning the causes of the green color of certain varieties of oysters. In some cases the color is said to be due to algae and in others to a high copper content.

[Milling and baking tests of wheat] (*North Dakota Sta., Rpt. Dickinson Substa.*, 1913, pp. 20-22).—A brief report is made of the results of milling and baking tests made upon 8 samples of wheat.

A study of certain conditions which affect the activity of proteolytic enzymes in wheat flour. C. O. SWANSON and E. L. TAGUE (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 5, pp. 1098-1109).—The experiments here reported were carried out in continuation of previous work (*E. S. R.*, 30, p. 164), and were designed to study the effects of a number of conditions on the activity of proteolytic enzymes in wheat flour, especially the effects of the inorganic compounds, potassium dihydrogen phosphate, potassium orthophosphate, potassium hydroxid, potassium sulphid, ammonium chlorid, calcium chlorid, and hydrochloric acid, and the organic substances, dried egg albumin, egg albumin digested in water at different temperatures, and casein. Descriptions are given of the method used, which was that of titration with formol to determine the amount of amino nitrogen present in the flour and as a means of measuring the protein cleavage due to proteolytic enzymes present.

Of the various salts tried, ammonium chlorid and calcium chlorid had the greatest accelerating effect on the rate of protein cleavage. "The proteolytic enzymes present in wheat flour caused a more rapid hydrolysis of the proteins when desiccated egg albumin was present, but not when casein was used."

The nature of the dietary deficiencies of the wheat embryo. E. V. MCCOLLUM, NINA SIMMONDS, and W. FITZ (*Jour. Biol. Chem.*, 25 (1916), No. 1, pp. 105-131, figs. 19).—The authors refer to earlier work, especially that reviewed (*E. S. R.*, 33, p. 666; 34, pp. 367, 368; 35, p. 166), and discuss the results of these earlier investigations briefly, in so far as they bear on human nutrition. The method pursued in the work by the authors is based on the following line of reasoning: "If a single natural food product fails to nourish an animal adequately, it may be due to (a) lack of sufficient protein or to proteins of poor quality; (b) an unsatisfactory mineral content due either to inadequacy of certain elements in amount, or to unsatisfactory proportions among them; (c) an inadequate supply of the fat-soluble A; (d) of the water-soluble B; (e)

or some toxic substance contained therein. One, two, three, four, or all of these factors may operate in inducing nutritive disturbances."

Experiments with laboratory animals (rats) are reported, in which was studied the effect of feeding wheat embryo alone or with other ingredients.

It is concluded that "the wheat embryo contains qualitatively all the factors essential for the promotion of growth and well-being in an animal, but these are not so proportioned that it can serve as a satisfactory diet without several modifications. The mineral content must be modified in certain respects before growth can proceed at all.

"The character of the proteins is excellent; no other proteins from plant sources which we have studied are superior to them. Rations containing but 10 per cent of these proteins are wholly adequate for growth at the maximum rate.

"Both the fat-soluble A and the water-soluble B, the factors which must be supplied by an adequate diet, but whose chemical natures are as yet unknown, are present; the first, in moderate concentration; the second, in very high concentration, as measured by the needs of the growing animal. Two per cent of wheat embryo supplies enough of the water-soluble B to promote growth at the normal rate for several months."

The wheat germ contains a substance which is toxic to animals. This factor is found in the fat fraction and is to a great extent removed by ether extraction. It has not yet been determined whether the toxicity is due to the chemical nature of the fats or to some substance associated with them.

The use of the butia palm as a food, J. PUIG Y NARRINO (*Insap. Nar. de Ganaderia y Agr. [Uruguay], Bol. 16 (1915), pp. 13*).—The palm herein described is an ornamental tree from which a number of food products are obtained. Analyses are given of the fruit, seeds, fiber, leaves, and the juice of the shoots (from which a honey is made).

The preparation and utilization of yeast as food, W. VÖLTZ (*Zeitsch. Spiritusindus., 39 (1916), Nos. 7, pp. 53, 54; 8, pp. 64, 65*).—In continuation of previous work (E. S. R., 34, p. 165), the author reports experimental data regarding the composition, digestibility, and uses of brewery yeast and of yeast cultivated in a medium of sugar and inorganic salts.

Dried yeast containing 95 per cent of water-free material was found to contain 50 to 60 per cent of protein, 2 to 4 per cent of fat, 25 to 30 per cent of carbohydrate, 6 to 8 per cent of ash, and nearly 2 per cent of phosphatides. In digestion experiments with men the protein, fat, and nitrogen-free extract were 50, 70, and 100 per cent digested, respectively, and the energy was 88 per cent available.

Honey in antidiabetic diet, A. Y. DAVIDOFF (*Russ. Vrach., 14 (1915), No. 26; obs. in Jour. Amer. Med. Assoc., 65 (1915), No. 16, p. 1412*).—Observations in seven cases of diabetes of the effect of using honey in the diet as a substitute for sugar and other sweet foodstuffs indicate that it prevents acetonaemia and diminishes the sugar content of the urine.

The content of stems in Java tea and the testing of tea, J. J. B. DERSCH (*Chem. Weekbl., 13 (1916), No. 3, pp. 66-71*).—Analytical data are given showing the percentage of stems in different kinds of tea. The more expensive brands of tea were found to contain a higher percentage of stems than the less expensive kinds, indicating that the evaluation of tea should not be made on the basis of stem content.

The composition of Hungarian wines, M. VUK (*Kísérlet. Közl., 18 (1915), No. 5-6, pp. 813-830*).—Data are given which show the composition of Hungarian wines, principally from the output of 1913, and some general information regarding the production and exportation of wines during the year 1913.

[Food and drug analyses], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta., Spec. Bul., 4* (1916), No. 3, pp. 72-80).—This part of the bulletin contains a report on prepared mustard by R. E. Remington, which includes analytical data. Information is also given regarding some proprietary medicines examined, and the results are reported of the analysis of several samples of foods and beverages.

The economics of electric cooking, P. W. GUMAER (*Univ. Missouri Bul., 16* (1915), No. 27, pp. 62, figs. 37).—The object of the investigation here reported was to ascertain some of the factors which increase the economy of electric cooking. Tests were made with three commercial and several especially constructed experimental ovens, in order to determine the amount of energy consumed in cooking, and the best methods of preparing different foods for the electric oven. The details of construction of the ovens are described in the bulletin, as are also the method of measuring by means of copper-constantan thermocouples, the temperatures of the ovens and the internal temperature of the foods during cooking. The experiments furnished considerable information as to the losses of energy in electric ovens due to convection and radiation, preheating, and the opening of the oven door.

"The energy lost when the door of an electric oven is opened for 15 seconds was determined for various oven temperatures. For an oven temperature of 200° C. (392° F.) used in baking bread, biscuits, etc., the loss due to opening a 12-inch by 18-inch oven door for 15 seconds amounted to 12 watt hours. At 5 cts. per kilowatt hour for electric current this would mean a cost of 0.06 ct. each time the door was opened for a period of 15 seconds.

"Since the purpose of cooking food is not to put as many heat units as possible into the food, but is rather to improve its flavor, and to increase its digestibility, the steam boiler method of determining efficiency is not applicable to electric ovens."

Considerable space is devoted to a discussion of the general efficiency of electric ovens. "In order to compare the cost of cooking in various electric ovens, a method proposed for indicating the relative efficiency of the electric ovens is to specify the amount of the preheating and the radiation losses at the required oven temperatures."

Experiments were undertaken to determine the most satisfactory and economical temperatures for roasting beef. Twenty-two rib roasts of like size and quality were boned, rolled, and roasted at 100, 120, 140, 160, and 180° C., the time required for the cooking, the loss in weight, and the amount of energy consumed at each temperature being measured. To secure uniform results in the degree to which the meat was cooked, each piece was removed from the oven when the interior reached a definite temperature. An inner temperature of 55° was taken to indicate meat that was rare, 65° medium rare, and 75° well-done meat, since these figures conformed to the usage of other experimenters. A table is given which shows the temperatures of the roasts on removal from the oven which gave the most satisfactory results as regards quality of the meat. The searing of the meat previous to roasting was accomplished in an open aluminium dish over a heating coil, this method being found to result in a saving of 5 cts., on the basis of 5 cts. per kilowatt hour for electric current, over the method of heating the whole oven up to 250° for 10 to 15 minutes in order to sear the outside of the meat.

Figures are given which show the time temperature curves for the inside of the roasts for different oven temperatures, which are of especial interest in cooking studies. "The shortest time of roasting was at 160°.

"The percentage loss of weight of the roasts was found to increase with the oven temperature used."

Other figures show the effect of oven temperature on the time of cooking of beef roasts and on losses in weight and the energy required to roast beef under different conditions.

"The energy required for roasting a rolled rib roast of beef in three types of electric ovens was determined for oven temperatures from 100 to 180°. The most economical temperature for preparing rare and medium-rare roasts was found to be 100° in each oven. For well-done roasts 120° is the most economical temperature."

A series of experiments were also carried out on the baking of biscuits, bread, and sponge cakes, in order to determine the range of temperature in which each of these could be most satisfactorily and at the same time economically baked. Curves are given which show the effect of oven temperature on the time of baking and the percentage of loss in weight and the energy required to bake each article under different conditions.

"The range of oven temperatures for baking biscuits was found to be from 200 to 240°. Starting with the oven at the required temperature, the energy used in making biscuits is practically the same for all oven temperatures. If it is necessary to heat up the oven from room temperature, the most economical oven temperature is the lowest which will give satisfactory results; i. e. about 200°.

"The range of temperatures for baking a small-sized loaf of bread was found to lie between 180 and 240°. Starting with the oven at the required temperature, the most economical temperature for baking bread is between 220 and 240°. When preheating is included, the most economical temperature for a small-sized loaf was found to be between 200 and 215°.

"The range of temperature for baking sponge cake was found to lie between 170 and 190°. For baking sponge cake the most economical oven temperature is the highest temperature which will give satisfactory results; i. e. about 190°. . . .

"For baking at the higher temperatures a heating element in the upper part of the oven is necessary to get the best results. Without the upper heating coil the bread, cake, or biscuits will burn on the bottom before they are satisfactorily browned on top. For the lower temperatures this upper coil is unnecessary."

It was also a feature of the experiments to determine the most economical thickness of heat insulation. It was concluded that "with electricity at 5 cts per kilowatt hour and allowing an interest and depreciation charge of 25 per cent, the most economical thickness of kieselguhr insulation was found for domestic use to lie between 3 and 4 inches."

In conclusion the author emphasizes the importance in electric cooking of accurate temperature measurements, adequate means of controlling the temperature of the food, and the formulation of definite rules or directions for the cooking of each article. A number of suggestions are given for the construction and operation of electric ovens to secure the best results.

Nutritional physiology, P. G. STILES (*Philadelphia and London: W. B. Saunders Co., 1916, 2. ed., pp. 288, pls. 4, figs. 19*).—The first edition of this book has been previously noted (*E. S. R.*, 28, p. 763).

Hunger and food, G. J. PEIRCE (*Sci. Mo.*, 2 (1916), No. 2, pp. 181-188).—This article considers some economic aspects of the food supply.

The amino-acid minimum for maintenance and growth, as exemplified by further experiments with lysin and tryptophane. T. B. OSBORN, L. R. MENDEL, ET AL. (*Jour. Biol. Chem.*, 25 (1916), No. 1, pp. 1-12, figs. 4).—In explanation of the fact that adequate growth has never been obtained with ration- in which the nitrogenous components do not furnish sufficient proportions of

amino acids, such as tryptophane, lysin, or cystin, the authors state that an essential feature of the construction of new tissue is a synthesis of new protein. Growth will, therefore, be limited by any factor preventing this synthesis, such as the lack of any component amino acid which can not be manufactured directly in suitable amounts by the body. The authors review briefly earlier experiments by themselves and others, which show the effects of tryptophane, lysin, and cystin upon growth when added to an otherwise deficient ration.

Additional experiments with laboratory animals (rats) are reported which show that "the need for tryptophane and lysin is governed by the 'law of minimum,' the rate of growth increasing with increasing amounts of these amino acids furnished by the food until the normal rate is attained. When larger quantities of these amino acids are supplied growth is not made more rapidly, for the construction of new tissue is no longer limited by deficiencies in the requisite supply of any element of the food, but by the natural capacity of the animal to grow."

The energy content of the diet (*Sci. Mo.*, 2 (1916), No. 3, pp. 279-306).—The following four papers form a symposium and were read before the Section of Physiology and Experimental Medicine of the American Association for the Advancement of Science, at Columbus, Ohio, in December, 1915:

Proteins in growth, by Ruth Wheeler (pp. 279-282).—This paper summarizes the results of recent investigations relative to the rôle of amino acids in nutrition and emphasizes the importance of the amino acid content, as well as other characteristics of proteins, in determining their food value.

The mineral nutrients in practical human dietetics, by E. B. Fortes (pp. 282-289).—In this article the author enumerates the functions of the mineral elements in metabolism and discusses their importance in the diet. The bulk of the material is essentially the same as that noted in an earlier paper (*U. S. R.*, 35, p. 62).

The chemical nature and physiological significance of so-called vitamins, by C. Voegtlin (pp. 289-293).—Recent investigations by the author and others are summarized and the importance of vitamins in practical dietetics is considered. A table is given showing the common foods which are relatively rich and relatively poor in antineuritic and antiscorbutic properties.

Food selection for rational and economical living, by C. F. Langworthy^a (pp. 294-306).—The author considers at length a number of factors which should be taken into account in securing an adequate and economical diet which at the same time gives satisfaction. Information is given regarding the selection, preparation, and cooking of foods, and the planning of meals.

As a guide for the housekeeper in the wise selection of food materials for a meal or for a day's ration, and also as a means of checking up and criticizing meals served, the author classifies the common foods into five groups, corresponding to their distinctive functions in nutrition. "The groups may be described in terms of the dietitian as follows: (1) Foods in which protein bears a higher proportion to fuel value than it does in the well-chosen diet as a whole; (2) those in which fuel value is high in proportion to protein, owing chiefly to the presence of much starch; (3) those in which fuel value is high, owing to the large percentage of fat; (4) those whose chief value is mineral constituents and vegetable acids (the latter important from the standpoint of flavor as well as of body needs); and (5) those which (like the foods in Groups 2 and 3) have a high fuel value, but in this case due to the presence of sugar. From the standpoint of fuel value only, it is obvious that Groups 2 and 5 could be combined. From the standpoint of the well-chosen and palatable meal, on the other

^a *Sci. Amer. Sup.*, 81 (1916), Nos. 2100, pp. 210, 211; 2101, pp. 230, 231.

hand, they should be kept distinct, since sugar is frequently as important as a flavor as it is as a food."

In discussing the practical use of this grouping of foods by the housekeeper, sample menus for the day's meals are given which contain food materials which are wholesome but combined in such a way as to furnish an excess of protein, fat, and carbohydrate.

ANIMAL PRODUCTION.

Silage investigations: Normal temperatures and some factors influencing the quality of silage, C. H. ECKLES, O. I. OSHEL, and D. M. MAGRUDER (*University of Missouri Sta. Research Bul. 22 (1916), pp. 3-32, figs. 7*).—In these investigations various types of silos were used, including the concrete, iron, stave, and tile silos, as well as small experimental silos. Temperature readings were taken by means of electrical resistance thermometers placed in half-inch iron pipe and the wires carried to the surface of the silage so that readings could be taken.

It was found that in the climate of Missouri the temperature of silage when put in the silo will generally range from 75 to 95° F. The temperature rises from 3 to 15°, reaching a maximum in from eight to twelve days. From this point on the temperature of the silage slowly declines. Where sufficient moisture is present and the silage is well packed the highest temperature will rarely exceed 100°. By December 1 the temperature reaches a point between 60 and 70°, and the lowest point, 50 to 60°, is reached by March.

The temperature in the silage in the early stage is influenced to some extent by the temperature of the atmosphere at the time of filling, and of the water used, if any be added. The greatest factor causing variations in the temperature in a silo is the amount of air contained in the silage. It was found, experimentally, that the presence of air and the resulting growth of mold increased the temperature in every case. The material used in the construction of the silo has but little, if any, influence upon the temperature of the silage.

In an experiment planned to determine the relation of the temperature in the silo to the quality of the silage produced, six cans holding about 10 gal. each were filled with corn from a large concrete silo while it was being filled. The corn was thoroughly packed in the cans and covers provided which would slip inside the cans. The cans were then placed in a screw press and heavy pressure applied. The lids were securely fastened before the pressure was removed and the cover was sealed around the edges with paraffin to exclude the air. Two cans were placed in a cooling room at a temperature of approximately 50°, two at a temperature of 68°, and the other two at a temperature of 100°. Twenty-three days after filling one can from each lot was opened, the silage compared as to appearance, odor, and taste, and samples were taken for acidity, moisture determinations, and chemical analysis. The three remaining cans were opened 58 days after filling.

No marked difference in the composition of the silage fermented at the three temperatures used was obtained. The acidity was decidedly the highest in the lot at medium temperatures. The protein showed practically no variation and the ether extract was practically the same in all, or was within the limit of error in making such analyses. There was some difference noticeable in the figures for crude fiber and nitrogen-free extract. In each case the percentage of crude fiber decreased between the date of the first sample and that of the second. It would seem safe to attribute this to the effect of the fermentation. The nitrogen-free extract was the highest in the lot at medium temperature and the lowest at the high temperature.

The highest loss in dry matter occurred at the highest temperature. It was evident from the odor and taste that there was considerable difference in the character of the fermentation which took place at the three temperatures, but all three lots would have passed as normal silage, although the lot at medium temperature was rather better than the lot at 50°, while that fermented at 100° was ranked slightly superior to the medium. Apparently a medium temperature from 77 to 85° is the most favorable for silage fermentations, but the results indicate that the limits can be extended to 60 and 100° at least without any material difference in the results. Temperatures much above this are not desirable, since such a temperature must mean the oxidation or destruction of some of the silage material to furnish the heat.

It is deemed evident that the quality of the silage produced will not be influenced by any effect upon temperature of the material used in constructing the silo, as analyses of silage from the wall and center of silos of various types of construction showed no difference in composition due to the materials used.

A comparison of silage from a large silo and of silage from the same corn put into a small experimental silo showed the quality to be the same, as judged by appearance and by chemical analysis. For all purposes, except studying temperature changes, the small silo is believed sufficiently accurate for experimental purposes. The experimental silos used were water tanks 3 ft. in diameter and 1 ft. high and constructed of 2-in. cypress. A wooden cover was made to fit closely and was provided with a ring of felt around the edge to make a reasonably tight joint. Weight was applied in the form of 1,500 lbs. of rock. This was estimated to equal the pressure to which silage is subjected at a point one-third of the distance from the top of a silo containing 28 ft. of average silage.

Feeding coconut cake on grass, K. J. J. MACKENZIE and E. H. POWELL (*Jour. Ed. Agr. [London]*, 23 (1916), No. 2, pp. 117-123).—Feeding experiments with weans indicate that coconut cake, when suitable in price, is a valuable feed for steers on grass, but that it is not very palatable and so should be gradually introduced into a mixture of palatable feeds. It is advised that the amount be restricted to 50 per cent of the concentrated ration, and that it be fed with something rather constipating, such as cotton cake. It is stated that a daily ration of 4 lbs. of a mixture of coconut cake, cotton cake, and linseed cake, 3:3:2, appears to give the best results.

The industrial utilization of the waste product of rice hulling, N. NOVILLI (*Gior. Riscolt.*, 5 (1915), No. 15, pp. 242, 243).—The results of feeding experiments are given which indicate that the pour waste product from rice hulling is easily digested and highly nutritious. The readiness with which the product becomes sour is an obstacle to its general use. It is suggested that it be converted into cakes, in which form it would keep for a long time and could be easily transported.

The nutrition of farm live stock, especially cattle, W. KLEIS (*Biochem. Ztschr.*, 72 (1915), No. 3-4, pp. 169-252, figs. 2).—This article reports a comparative study made of the Zuntz, Regnault-Relset, and Pächner methods of metabolism measurement.

It is concluded that the Zuntz method of gas interchange measurement is the best for determining the influence of the biological processes on the gas interchange, but there appears to be a close agreement with all three methods. The calculation of the energy balance alone by respiration experiments, that is O_2 consumption and CO_2 elimination, when compared with the chemical analysis of the intake and output was in close agreement.

It was found that the castration of hulls was without influence on the energy assimilation. It was demonstrated that more than 14 per cent of the total carbon dioxide elimination in cattle was by way of the skin and intestines.

The results of these experiments showed a higher energy consumption in older steers than those secured by Dahm (E. S. R., 25, p. 674), but were in close agreement with the Armsby calorimeter results (E. S. R., 15, p. 750). It was apparent that the maintenance requirements in the various ages of cattle were in proportion to the body surface.

Non-disjunction as proof of the chromosome theory of heredity, C. B. BRIDGES (*Genetics*, 1 (1916), Nos. 1, pp. 1-52, pl. 1, figs. 8; 2, pp. 107-163, pl. 1, fig. 1).—In this paper experimental proof is offered that "particular chromosomes, the X chromosomes, are the differentiators of sex; the X chromosome constitution of an individual is the cause of the development by that individual of a particular sex, and is not the result of sex already determined by some other agent. The sex is not determined in the egg or the sperm as such, but is determined at the moment of fertilization; for the X sperm of the male gives rise to a female when it fertilizes an egg containing an X, but to a male if it fertilizes an egg containing a Y or no sex chromosome at all. Likewise the Y sperm of a male gives rise to a female when fertilizing an XX egg, and to a male when fertilizing an X egg. These facts in connection with the fact that an X egg of a female produces a male if fertilized by an X sperm prove that the segregation of the X chromosomes is the segregation of the sex differentiators. The presence of two X chromosomes determines that an individual shall be a female, the presence of one X that the individual shall be a male. The origin of these chromosomes whether maternal or paternal is without significance in the production of sex.

"The Y chromosome is without effect upon the sex or the characters of the individual, for males may have one Y, two Y's, or may lack Y entirely (males lacking Y are sterile); and females may have one or two supernumerary Y's with no change in appearance in any case."

A bibliography of references is appended.

A sex-limited color in Ayrshire cattle, E. N. WENTWORTH (*E. S. Dept. Agr. Jour. Agr. Research*, 6 (1916), No. 4, pp. 141-147).—It is stated that a gene which seems to fall under the sex-limited group is found in the inheritance of black and white as alternative to red and white in Ayrshire cattle. If the factor for the black and white color is represented by *B*, the hereditary constitutions are as follows: *BB* is always black and white; *bb* is always red and white; and *Bb* is always black and white in the male and red and white in the female.

In breeding experiments at the Kansas Experiment Station all of the nine possible matings were discovered. From the data obtained it appears that the black and white color of Ayrshire cattle behaves in an ordinary sex-limited manner similar to the horns in sheep as discussed by Woolf and the rudimentary mammae in swine as reported by the author (E. S. R., 27, p. 769).

It is concluded that black and white color is a simple allelomorph of red and white color in Ayrshire cattle. In the male the black and white character is dominant and in the female the red and white character is dominant. Males heterozygous for the two characters are black and white, while females heterozygous for the two characters are red and white.

Sheep raising in Wisconsin, F. KLEINHENTZ (*Wisconsin Sta. Bul.* 263 (1916), pp. 19, figs. 11).—This bulletin deals with the opportunities for successful sheep raising in Wisconsin and the methods of care, feeding, and management.

Fish meal as food for pigs, C. CROWTHER (*Jour. Bd. Agr. (London)*, 7 (1916), No. 1, pp. 27-33).—Pigs fed fish meal in addition to a basal ration of bran and middlings made 1.35 lbs. greater gains per pig weekly than those fed

the basal ration alone. When slaughtered the fish-fed pigs showed no undesirable appearance, color, or smell in any part of the carcass, and at no stage of cooking could an exceptional smell or flavor be detected.

Large-type swine and fertility. E. N. WESTWORTH (*Breeder's Gaz.*, 69 (1916), No. 13, pp. 722, 723).—In an investigation conducted at the Kansas Experiment Station 1,000 litters of large-type Poland-Chinas and 1,100 litters of small-type Poland-Chinas were compared for average size. The large type farrowed litters of 7.854 pigs on the average, while the small type farrowed 7.896 pigs, the difference in fertility between the two strains of swine thus being insignificant.

The average amount that the group of large-type sows varied from its average litter, 2,141 pigs per litter, was compared with the average amount that the small-type sows varied from their average litter, 2,146 pigs per litter. The advantage in this case is in favor of the large type, since it is more desirable to have a small deviation; but, again, the difference is not great enough, either practically or theoretically, to be significant.

Swine production in Holland and its development in the last hundred years. H. M. KROON (*Die Schweinezeit in Holland und ihre Entwicklung in den letzten 100 Jahren. Inaug. Diss., Univ. Bern, 1915, pp. 65, pls. 6*).—This dissertation treats of the various breeds of swine found in Holland, their distribution and improvement, methods of care and management, and the general status of the industry.

Experimental results in fattening poultry. M. A. JULL (*Jour. Amer. Assoc. Agr. and Invest. Poultry Husb.*, 2 (1916), No. 7, pp. 40-52).—In these experiments, conducted in Canada, three lots of birds received corn meal, oatmeal feed, and ground buckwheat as their respective grain rations. The ground feed was moist with water, allowed to stand for at least twelve hours before feeding, and when a batter just thin enough to run out of a pail without difficulty. The birds were fed twice daily, the first feed being given early in the morning and the second one late in the afternoon. All food was removed from the feeding troughs as soon as the birds had satisfied their appetites.

It was found that less grain was required to produce 1 lb. gain in flesh when the birds were fed on corn meal than when fed on a ration of equal parts, by weight, of corn meal, oatmeal feed, and ground buckwheat, or when fed on a ration of pure oatmeal feed, also that the mixed ration was somewhat superior to the oatmeal ration in that respect. It was also shown that less grain was needed to produce 1 lb. gain in two weeks than in three weeks with the three rations, and that the extra profit obtained by feeding three weeks was not sufficient to warrant the practice, so that two weeks' feeding is to be preferred. While oatmeal feed gave the cheapest gains the mixed feed gave the largest profits, with oatmeal feed last in this respect.

The weights between live, dressed, and drawn poultry showed a gradual shrinkage, with much less loss of weight between the live and dressed birds than between the dressed and drawn birds. The difference in profit was also comparable, being in favor of dressing and showing an actual loss in drawing.

The profits derived from poultry fattening were 39.5 per cent on the investment. **Efficiency in roaster production.** H. R. LEWIS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb.*, 2 (1916), No. 6, p. 48).—Experiments conducted at the New Jersey Experiment Stations with Plymouth Rock and White Leghorn chickens indicated that at nine months of age the Leghorns were matured and could soon become staggies, while the Rocks were in prime condition for slaughter. The average weight of the Rocks was 7.2 lbs., and of the Leghorns 3.8 lbs. The weight of the dressed carcass (weight after bleeding and picking and removing the heads, shanks, and offal) at the same age showed that in the case of the

Plymouth Rocks 75 per cent of the total carcass was available, while in the case of the Leghorns only 67.3 per cent was available. At this age the Barres, Plymouth Rocks sold for 27 cts. a pound and the Leghorns for 21 cts.

Meat scrap in the laying ration, H. R. LEWIS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb.*, 2 (1916), No. 7, pp. 52, 53).—In these experiments, conducted at the New Jersey Experiment Stations, pen 1 received 25 per cent of meat scrap in its dry mash and pen 2 received 10 per cent. Pen 1 laid 6,711 eggs during the first year, 4,207 the second, and 3,048 the third year, while pen 2 laid 4,639, 4,358, and 2,674 eggs during the respective years.

From the results of the experiments it is concluded that the higher percentage of meat scrap in the dry mash was justified, at least during the pullet year, as the profit above feed was \$127.88 as against \$75.60 in the pen receiving the low percentage of meat scrap. The first year of egg production in the first-mentioned pen was followed by a comparatively low production, whereas the production in the pen which had not been forced during the pullet year was only slightly decreased. The same results seemed to show during the third year, so that the general conclusion is drawn that high production during the pullet year is apt to be followed by decreased production in future years.

The mortality was practically uniform in each pen, the birds in both pens remaining in good condition in general throughout the period. The hatchability in each pen was practically uniform, and the size and weight of eggs in each pen were not noticeably different. Under systems of management where birds are kept for two laying years only, a higher percentage of meat scrap can undoubtedly be advised, as the increased production during the first year will more than balance the difference during the second year.

A study of egg production and some related factors, L. E. CARD (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb.*, 2 (1916), No. 6, pp. 32-44).—Records kept of laying hens at the Connecticut Storrs Experiment Station showed that a given pen will consume much more oyster shell when laying heavily than when laying less heavily or not at all. Using 32 pens of Single Comb White Leghorns a correlation table was worked out so that this relationship might be expressed mathematically. For this purpose the year was divided into thirteen four-week periods. The number of eggs laid by any given pen during any four-week period was used as the basis of distribution for one system of arrays, while the amount of oyster shell consumed during the same period was used as the basis for the other system of arrays. The coefficient of correlation as worked out from this table was $0.8724 + 0.0070$, showing that a very close correlation exists between the factors under discussion. The same method, when applied to the heavy breeds, viz, Plymouth Rocks, Rhode Island Reds, and Wyandottes, taken collectively, showed a correlation factor of $0.8265 + 0.0096$.

Similarly the relation between the amounts of grain and mash consumed and the corresponding egg production was worked out. In the case of the Leghorns there was a close correlation between the amount of mash consumed and the number of eggs laid, i. e., $0.7493 + 0.0157$, while there was practically no correlation between the amount of hard grain consumed and the number of eggs laid, the correlation coefficient in this case being $0.0214 - 0.0353$. The same general result was obtained in the case of the heavy breeds.

It appears from the study thus far conducted that the production during the summer months, except in the case of Wyandottes, is perhaps a better index of the yearly egg yield than is the winter production.

Value of egg shows, A. S. CHAPIN (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb.*, 2 (1916), No. 7, pp. 53, 54).—The methods and plans used in holding annual egg shows at Purdue University are outlined.

The poultry industry, its importance in agricultural development, H. M. LAMON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husband.*, 2 (1916), No. 6, pp. 41, 42).—An abstract of a paper presented before the Second Pan American Scientific Congress, giving a general review of the development of the poultry industry in the United States and other countries.

The management of the farm poultry flock, V. G. AUBRY (*New Jersey Stat. Circ.* 49 (1915), pp. 20).—This circular deals with the housing, feeding, care, and management of the farm poultry flock.

The Flemish system of poultry rearing: Scientifically improved, MADAME B. A. JASPER (*Country Life* [London], 37 (1915), Nos. 956, pp. 577, 578, fig. 1; 957, pp. 635, 636; 958, pp. 672-674, figs. 2; 960, pp. 743-745, fig. 1; 962, pp. 838-840; 964, pp. 913-915; 98 (1915), Nos. 967, pp. 88, 89; 969, pp. 171-173; 971, p. 245; 973, pp. 294, 295; 975, pp. 367-369; 977, p. 437; 979, pp. 8*, 10*; 980, pp. 528-530).—A very comprehensive treatise on the Flemish methods of breeding, incubating, brooding, housing, feeding, care, and management of poultry for meat and egg production.

American pheasant breeding and shooting, F. A. QUARLES (Wilmington, Del.: Hercules Powder Co., 1916, pp. 130, figs. 52).—General methods of breeding, feeding, care, and management of pheasants are described.

DAIRY FARMING—DAIRYING.

[Convention of milk and butter producers at Washington, D. C., 1916] (*Amer. Food Jour.*, 11 (1916), No. 6, pp. 244-253).—An account of the convention of milk and butter producers and other dairy interests held at Washington, D. C., May 5 and 6, 1916 (*E. S. R.*, 35, p. 98).

On the change in the composition of the milk of cows, O. ALLEMANN (*Wichter. Zentbl.*, 44 (1915), No. 8, pp. 122, 123).—Analyses are given of colostrum milk and of milk at short intervals after parturition, showing the rapid changes that take place.

Effect of water in the ration on the composition of milk, W. F. TURNER, R. H. STRAW, R. P. NORTON, and P. A. WRIGHT (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 4, pp. 167-178, fig. 1).—In these studies four different methods of varying the water content of the ration were used: A full r. a limited allowance of drinking water; turnips r. a dry-roughage ration; wet r. dry beet pulp; and green r. dry crimson clover.

Certain individual cows at times produced milk having an abnormal fat content. This effect was apparently independent of the ration, as it occurred not only with the high water-content ration but with the dry as well.

A study of the data obtained in the four series, however, shows that the watery character of the ration has no effect upon the fat content of the milk. There was even less variation in the other milk constituents than in the fat. This indicates that rations of varying water content have no effect upon the composition of milk.

A bibliography of literature cited is given.

The influence of sickness on the composition and characteristics of cow's milk, R. BERGMAN (*Untersuchungen über den Einfluss einiger äusseren und inneren Krankheiten auf die Zusammensetzung und die Eigenschaften der Kuhmilch*, *Luang. Diss.*, Univ. Bern, 1915, pp. 78).—The specific gravity of milk was in general not noticeably altered by sickness of the animal. The chlorin content was in general high. The milk-sugar content often showed a decline, while the fat content was as a rule higher than normal. The diastase content showed an increase of this enzyme, and the catalase content was very often high.

The composition of the milk of Egyptian animals, A. PAPPEL and G. HOGAN (Cairo: Dept. Pub. Health, 1914, pp. 12).—An analysis of Egyptian buffalo milk is given.

Effect of pasteurization on mold spores, C. THOM and S. H. AYERS (U. S. Dept. Agr., Jour. Agr. Research, 6 (1916), No. 4, pp. 153-166, figs. 3).—Studies were made with spores from pure cultures of a series of molds including several species of *Penicillium*, of *Aspergillus*, and of the mucors, with, in some experiments, the addition of *Oidium* (*Oospora*) *lactis* and one strain of *Fusarium*. These sets of experiments were made to test the temperatures used in pasteurization by the holder process, those used in the flash process, and the effects of dry heat.

In the holder process of pasteurization, in which milk was heated to from 120° to 150° F. and maintained at these temperatures for 30 minutes, the *Mucor racemosus* group and *Rhizopus nigricans*, which are found more frequently than all others of the mucor group combined, were destroyed at 130°. The common green species of *Penicillium* are mostly dead at 130°; a few stand 135°, but two, one of them an undescribed soil organism, survived 140° for 30 minutes. Among species of *Aspergillus*, however, the strains of *A. flavus*, *A. fumigatus*, and *A. repens* all survived 145° for 30 minutes, and *A. repens* and *A. fumigatus* both survived 150°. These three species are always found in forage and feeding stuffs; hence, milk is more or less subject to contamination with them. *A. repens* grows very poorly in milk, however, and the examination of a great many cultures of milk and its products has shown that the actual development of *A. flavus* and *A. fumigatus* is comparatively rare. Pasteurization of milk at 145° may therefore be regarded as destroying mold spores completely enough to render them a negligible factor in the further changes found in the milk.

In the flash process of pasteurization, where milk was heated to from 145° to 175° for a period of 30 seconds, the spores of all the molds tested were destroyed with the exception of many spores of one form and occasional spores of three more forms. At 175° only occasional spores of two forms developed.

When the heating process was performed in dry air for a period of 30 seconds at 200°, 31 out of 42 forms of *Penicillium* and 7 out of 24 forms of *Aspergillus* were destroyed, but none of the cultures of the mucors. A temperature of 250° over a period of 30 minutes killed all the forms of *Penicillium* spp. tried, but left an occasional living spore in one species of *Aspergillus* and 3 out of 6 mucors.

Careful study of the cultures showed that the first effect of heating was to delay germination. At times heating to a degree just under the death point delayed germination almost the full length of the usual growing period of the species. There is frequently a survival of a few spores where a majority of the spores die. There may be, therefore, a difference of as much as 20° between the temperature at which an occasional culture is completely killed and that at which cultures of that species are uniformly killed. These results resemble those obtained in determining the thermal death point of bacteria.

Metallic flavor in dairy products, E. S. GUTHRIE (New York: Cornell Sta. Bul. 373 (1916), pp. 609-643).—The results of these studies seemed to indicate that there may be a cause of metallic flavor other than direct contact of the dairy product with metal. In several instances it seemed to increase when the product was not in contact with metal.

Buttermilk in sterilized glass bottles developed the flavor in many cases. Of 241 samples of cream in sterilized glass bottles metallic flavor was produced in 79 by inoculation with metallic-flavored buttermilk; and of 157 samples of cream in sterilized glass bottles which were inoculated with individual bacteria, 52 showed metallic flavor. It is concluded that the organism that causes metallic

flavor is a member or a strain of the *Bacterium lactis acidi* group. Metallic flavor may develop in cream of either good or poor flavor, and the indications are that enzymes may be a factor in its production.

It was found that high acid content is essential for the development of the flavor. It is possible that electrolytic action plays an important part in its production when the source is directly from metal. The flavor was most likely to appear during the hottest season. It may be that this was noticeable because the degree of acidity of the product is likely to be greater when the temperature is high.

A high fat content seemed necessary for the development of the flavor except in the case of buttermilk. Whenever the flavor was found in whole milk it was always near the surface, in the cream, and it was never observed in skim milk or cottage cheese. For some reason it was often found in buttermilk, but with this exception never in a dairy product low in fat content.

It is deemed difficult to explain why metallic flavor develops to a greater degree in buttermilk than in any other dairy product. It was thought that there might be a relation between the acids of the milk fat and the metallic flavor. Samples of butyric, caproic, caprylic, palmitic, stearic, and oleic acids were obtained, also propionic acid, which is lower in the fatty acid series, and succinic acid, which is a dihasic organic acid and may be found in dairy products. No sign of metallic flavor, however, could be detected in any of these acids.

The flavor appeared spasmodically. Often it could not be detected in butter for several weeks, and sometimes for many months, after which it suddenly appeared for perhaps a few days or possibly for several weeks. During all this time the same utensils were being used on the farms and in the creamery laboratories. Low temperatures often seemed to make the flavor more apparent.

Note on the neutralization of cream in butter manufacture, and the effect on the butter produced, A. A. RAMSAY (*Dept. Agr. N. S. Wales, Sci. Bul. 16 (1915), pp. 10*).—A method of treating cream before manufacturing it into butter, known as "neutralizing and pasteurizing" is described. The term neutralizing, in conjunction with pasteurizing in the method of treating creams for the manufacture of butter, is used to indicate the reducing of the acidity, probably the excessive acidity, of the cream, not to the neutral point but to faint or slight acidity, say, to 0.2 per cent of acid expressed as lactic acid.

Sodium bicarbonate or, as an alternative, washing soda (crystallized sodium carbonate) is generally used on account of its cheapness and because the supply is plentiful. The result of the neutralization or partial neutralization is the formation of the sodium salt of the organic acids and the liberation of carbon dioxide. The carbon dioxide so formed is impeded in its passage through the cold mass of cream on account of the viscosity of the latter. This viscosity is lessened when the cream is heated to 170° F., as in pasteurizing, and the gas then escapes into the air. As it rises through the mass of cream it is claimed that it carries with it mechanically the volatile substances which give the cream an unpleasant smell or taste, as, for example, "food taint," and the heating to 170° assists in the removal of the gas and in the destruction of the micro-organisms present. The result is a product from which unpleasant odors and taints have been removed, and one which, if not absolutely sterile, is very nearly so. Into this mixture the pure culture of lactic bacilli, or "starter," is added, thus making an abundant growth of the lactic bacilli and producing good, clean lactic acid. The carbonates which may be used for the

purpose of either neutralizing or reducing the acidity of cream are sodium bicarbonate, washing soda, anhydrous sodium carbonate, and calcium carbonate.

Although the primary action of the alkaline carbonate or bicarbonate is simply to neutralize the free acids present, there will probably also be some action between the alkali added and the proteid matter present.

There appears to be reason to believe that in chemical composition butter made from neutralized and pasteurized cream should very closely approximate, if not coincide with, butter made from untreated cream. The skill, knowledge, and ability of the butter maker will be the principal factor which will control the amount of curd which will be present in the finished butter. Other things being equal, it appears justifiable, however, to expect somewhat less curd in butter made from neutralized than in that from untreated cream.

The butter industry in the United States, E. WISER (*Columbia Univ. Stud. Polit. Sci.*, 69 (1916), No. 2, pp. 264, figs. 12).—This is a report of an economic study made of the butter and oleomargarine industries in the United States. The topics discussed are the manufacture of butter, organization for the production of butter, geographic distribution of butter-producing areas, organization for dairy education, grading and judging butter, history and development of the organization of the butter market, the present organization of the butter market, butter prices, adulteration and oleomargarine, and the oleomargarine law and its development.

Test to determine amount of yellow color in a product (*Hourd's Dairyman*, 49 (1915), No. 11, p. 439).—It is reported that the U. S. Bureau of Standards has found that the color of butter and oleomargarine can be satisfactorily graded by the ratio of its reflecting powers for blue and yellow light.

The yoghurt bacillus, F. DECHŁČEK (*Biochem. Ztschr.*, 70 (1915), No. 3-4, pp. 269-293).—The author conducted comparative experiments with the yoghurt bacillus as described by the workers at the Pasteur Institute and with the bacillus as described by Effront.

There was found to be a difference between these two types as regards the choice of the medium in which they develop. Bacillus F (Effront) developed exceedingly well in all the usual media, while *B. bulgaricus* was very exacting in this respect, requiring, besides a particular kind of sugar, the addition of lime for the neutralization of the acid, especially in artificial media. The two types differed as to their air requirements, *B. bulgaricus* growing in an anaerobic medium, while Bacillus F was distinctly aerobic. The two bacteria may also be distinguished by differences in the length of life, *B. bulgaricus* dying after three months and Bacillus F living for several years.

See also previous notes by Effront (*E. S. R.*, 25, pp. 81, 609, 610) and Destrand (*E. S. R.*, 25, p. 600).

Studies on *Lactobacillus fermentum*, J. SMIT (*Ztschr. Gärungsphysiol.*, 4 (1915), No. 4, pp. 273-293, figs. 3).—This article reports a morphological study made of *L. fermentum*.

VETERINARY MEDICINE.

A handbook of veterinary medicine, H. J. GOSSET (*Aide Mémoire de l'Élève naïre Médecine, Chirurgie, Obstétrique, Formules, Police Sanitaire et Juridique prudence Commerciale*. Paris: J. B. Baillière & Sons, 1915, pp. VIII+226, figs. 252).—This is a ready reference work for the veterinarian.

Essentials of veterinary law, H. B. HEMENWAY (*Chicago: Amer. Jour. Vet. Med.*, 1916, pp. XIV+340).—The several parts of this work pertain to (1) the principles, (2) veterinary practice, (3) governmental control, and (4) animals generally.

Report of proceedings under the diseases of animals acts for the year 1914 (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim., 1914, pp. 79*).—This is the usual report (E. S. R., 32, p. 778), dealing with the occurrence of infectious diseases of domestic animals, and giving statistical data, etc.

Report on operations of the veterinary sanitary service of Paris and the Department of the Seine during the years 1913 and 1914, H. MARTEL (*Rap. Opér. Serv. Vet. Sanit. Paris et Dept. Seine, 1913; 1914, pp. 167, figs. 21*).—These are the usual reports (E. S. R., 29, p. 880), giving detailed accounts of the work of the years 1913 and 1914.

The poisonous character of rose chafers, J. M. BATES (*Science, n. ser., 43 (1915), No. 1102, pp. 209, 210*).—The author records a serious loss among brook trout of Pine Creek, at Long Pine, Nebr., apparently due to feeding on rose chafers, which feed on and sometimes strip bare willows (*Salix fluviatilis*) that overhang the stream.

The significance of optimal culture media in testing disinfectants, K. SEFFLE and A. DENGLE (*Arch. Hyg., 85 (1916), No. 4, pp. 189-197*).—The optimal media for obtaining an after-culture of staphylococci was found to be a 3 per cent glucose bouillon. For anthrax spores a 3 per cent glucose bouillon with the addition of 5 per cent horse or cattle serum yielded the most satisfactory results.

Antiphenol serum, JANINA WISZNIEWSKA (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 20, pp. 609-612*).—The author has isolated a substance from the products of intestinal putrefaction of protein which gives all the characteristic tests with phenolic reagents but which could not be identified as any known phenol derivative. The product is strongly alkaline and possesses some of the general characteristics of the leucomains. It is thermostable. When administered to animals with food it produced definite and characteristic atheromatous lesions of the arteries. When injected intravenously into a horse an antibody was produced which was employed as a therapeutic agent.

On the acetylene gas treatment in ringworm, sarcoptic, symbiotic, and dermatodectic manges, R. SROKOE (*Vet. Rec., 28 (1915), No. 1433, pp. 279, 280*).—The author has found that powdered calcium carbide applied to the affected part (which has been moistened following a thorough scrubbing) and allowed to effervesce from a minute to a minute and a half, will destroy the ringworm parasite. Carbide can also be used with success in destroying mange parasites.

On the refractive index of the serum in a guinea-chicken hybrid, R. PEARL and J. W. GOWEN (*Proc. Soc. Expt. Biol. and Med., 12 (1914), No. 2, p. 48; abs. n. Maine Sta. Bul. 245 (1915), pp. 292, 293*).—In connection with some biochemical studies on heredity at the Maine Experiment Station it was observed in a guinea-chicken hybrid, produced from the mating of Cornish Indian Game and guinea fowl, that "there is a definite, characteristic, and permanent difference between the refractive index of the serum of the fowl and that of the guinea; and that in the hybrid the guinea parent is dominant in respect of the physicochemical constitution of the blood as measured by the refractive index."

The origin of the antibodies of the lymph, F. C. BECHT and A. B. LUCKENBART (*Amer. Jour. Physiol., 40 (1916), No. 2, pp. 366-371, figs. 3*).—"The concentration of antibodies is greater in the serum than in the thoracic lymph, and greater in the thoracic lymph than in the neck lymph, not only in the actively immune animal but also in the passively immune animal; not only after equilibrium is established but at the time when active exchange is occurring. The source of the antibodies of the lymph is the blood by direct exchange

from that fluid. There is no evidence that antibodies originate from the tissues and are emptied into the lymph stream at the seat of formation."

Researches on anaphylaxis produced by diglycylglycin, E. ZWETZ and MILE. DIAKONOFF (*Biochem. Jour.*, 10 (1916), No. 1, pp. 160-168).—Anaphylaxis was produced by the injection of diglycylglycin into rabbits repeated at intervals of seven days. Three injections were occasionally sufficient to produce this effect, but a greater number were preferable for producing clear and definite results. The typical symptoms of anaphylactic shock, viz, fall of arterial pressure, increased respiration, and increased peristaltic action, were produced by these injections. A fall in the arterial pressure of more than 2 cm. of mercury was considered as an indication of anaphylactic shock. The intravenous injection of the peptid into a normal animal led to no effect on the normal respiratory rhythm.

The diglycylglycin also displayed some action on the coagulation of the blood. A study of the coagulability of the blood, however, did not serve as a criterion for determining anaphylactic shock in animals previously prepared by the subcutaneous injections of the peptid.

Remarks on the nature and significance of the so-called "infective granules" of protozoa, E. A. MINCHIN (*Ann. Inst. Pasteur*, 29 (1915), No. 11, pp. 537-544, figs. 2).—"This brief note does not bring forward any facts hitherto unknown, but attempts to compare and coordinate certain known facts with a view to demonstrate their essential similarity and homology. The conclusion reached is that the phrase 'infective granule' is misleading and erroneous, since the bodies so termed are true endogenous chromidial buds. Consequently the term 'granule-formation' should be replaced by 'endogenous bud formation' and the term 'granule shedding' by extrusion of buds or some similar phrase."

On the action of cholera virus in the immune animal organism, O. BAT (*Ztschr. Immunitätsf. u. Expt. Ther.*, I. Orig., 24 (1916), No. 4, pp. 380-401).—It has been shown that the union of cholera immune serum with the virus of the cholera vibrio in its various forms is not a permanent one, but that a cleavage takes place by which, on the one hand, serum-immune bodies are formed as indicated by the earlier investigations of Pfeiffer, Friedberger, and Ball, and at the same time cholera virus is liberated which can be demonstrated either by complement fixation or animal inoculation. To this liberation of cholera virus is attributed the weak antitoxic action of anticholera sera. The necessity of the preparation of a serum which will permanently bind the cholera virus (endotoxin) is indicated.

[Foot-and-mouth disease], L. HOFFMANN (*Bekämpfung der Maul- und Klauenseuche durch Heilung der kranken Tiere*, 1 and II; *Sichere und rasche Bekämpfung und Vertilgung der an sich harmlosen Maul- und Klauenseuche*, III; *Heilung der Kranken und Vertilgung der Maul- und Klauenseuche nach meinem System*, IV. Stuttgart: Stähle & Friedel, 1912, Nos. 1, pp. VII+100, pl. 1, figs. 2; 2, pp. XVI+101-232, figs. 49; 1914, Nos. 3, pp. 293-468, pl. 1, figs. 4; 4, pp. 409-502).—The first two parts of this work deal with the control of foot-and-mouth disease through the curing of affected animals; part 3 with the control of the disease; and part 4 with the cure and eradication of the disease by the author's method.

[Poliomyelitis: Its possible occurrence in the lower animals and the relation of insects to its transmission] (*Ann. Rpt. Bd. Health Mass.*, 35 (1914), pp. 535-601, pt. 1).—Several papers here presented include the following: Further Experiments in Poliomyelitis, by M. J. Rosenau (pp. 535-557), in continuation of those previously noted (*E. S. R.*, 28, p. 160), which reports transmission experiments with the stable fly (*Stomoxys calcitrans*), largely in tabular form; Experiments to Determine If Paralyzed Domestic Animals and Those Associated

with Cases of Infantile Paralysis May Transmit This Disease, by G. Ten Broeck (pp. 558-577); and A Study of an Epidemic of Infantile Paralysis (Acute Epidemic Poliomyelitis) Occurring in the Southern Connecticut Valley District from November 1, 1911, to November 1, 1912, by J. V. W. Boyd (pp. 578-601). In which is given a brief account of a contemporary animal sickness among horses and an epidemic of paralysis among birds.

The experiments reported by Rosenau, carried on in 1912 and 1913, failed to corroborate the earlier experiments and give no evidence that the stable fly transmits infantile paralysis. In the experiments by Ten Broeck 48 animals were received and the material from 30 of these, including 4 rats, 7 fowls, 9 cats, 3 horses, 4 swine, 1 dog, and 2 cows, was injected into monkeys, but in no case did the monkeys inoculated show any signs of a paralysis or symptoms which would indicate that they were infected with poliomyelitis.

Present views in respect to modes and periods of infection in tuberculosis, M. P. RAVENEL (*Jour. Amer. Med. Assoc.*, 66 (1916), No. 9, pp. 613-618).—The evidence at hand indicates that in the majority of cases the respiratory tract is the route of infection in tuberculosis. The alimentary tract is a frequent portal of entry for the tubercle bacillus. The tubercle bacillus is able to pass through the intact mucous membrane of the alimentary tract without producing a lesion at the point of entrance. This takes place most readily during the digestion of fats. The bacilli pass with the chyle through the lacteals and thoracic duct into the blood, which conveys them to the lungs, where they are retained largely by the filtering action of the tissues. Infection through the alimentary tract is especially frequent in children.

"Infancy and childhood are preeminently the periods of life when the individual is susceptible to tuberculous infection, and the majority of cases of infection occur during these early years. Any campaign against tuberculosis which leaves out of consideration the protection of children against infection will fail of success. Tuberculous infection in adult life occurs, but not so frequently or readily as generally believed. Tuberculous infection may occur at any age."

Experimental investigations on the determination of the smallest number of bacilli which will produce tuberculosis in the guinea pig; first communication, I. THÜNI and A. C. THAYSEN (*Centbl. Bakt. [etc.]*, 1, Abt., Orig., 77 (1916), No. 4, pp. 308-319).—The authors were unable to confirm the findings of earlier investigators that so small a number as from 10 to 20 bacilli were sufficient to initiate the disease in the guinea pig. In one test series of 19 animals in which a highly virulent culture in doses of from 10 to 76 bacilli was used it was possible to establish a tuberculosis infection in only one animal after a period of 41 days. In a second series of 22 animals inoculated with doses of from 99 to 343 bacilli the results were entirely negative.

The technique for counting the number of micro-organisms used was the India-ink staining procedure of Burri.

The tubercle bacillus and arsenic, CHARPENTIER (*Ann. Inst. Pasteur*, 29 (1915), No. 9, pp. 443-458).—In the investigation it was demonstrated that an active growth of the tubercle bacillus took place in a bouillon containing sodium arsenate or atoxyl. The growth was less active in the presence of sodium methyl arsenate and difficult in the presence of sodium cacodylate. The organisms absorbed arsenic from solutions of sodium arsenate and atoxyl. The virulence of the organisms was not changed by such treatment, since they produced an active infection when injected into guinea pigs. It is indicated that the presence of the arsenic in the bacilli probably increases their resistance to destructive agencies. Similar results were obtained with other organisms, viz. *Aspergillus*, *Bacillus coli*, *B. subtilis*, and yeasts. Injections of so-

dium cacodylate did not modify the course of an infection in guinea pigs which had been previously initiated by inoculation of virulent organisms, although the treatment was begun at once.

Clinical observations on coccidiosis in cattle and carabaos, C. H. SCHULTZ (Philippine Agr. Rev. [English Ed.], 3 (1915), No. 2, pp. 115-134).—This paper relates to studies accounts of which have been previously noted (E. S. R., 35, p. 76).

Contributions on ox warbles (*Mitt. Ausschusses Bekämpf. Dauscelpage*, 1912, Nos. 1, pp. 28; 2, pp. 16, pls. 4; 3, pp. 37, figs. 10; 4, pp. 26, fig. 1; 1913, No. 5, pp. 39, pls. 4, figs. 2; 1914, No. 6, pp. 31).—These several contributions relating to ox warbles are as follows: (1) Ox Warble Injury and the Removal of Ox Warbles, by R. Kranse; (2) Ox Warble Flies, by H. Gläser; (3) Investigations of Hypodermia Larvae, by Peter, Ox Warble Removal, by Schöttler, and Warble Flies: The Egg and Oviposition of the Large Warble Fly (*Hypoderma bovis*), by H. Gläser, previously noted (E. S. R., 29, p. 761); (4) Warble Flies, Observations on the Life History of the Large Warble Fly (*H. bovis*) and Rearing Experiments, by H. Gläser, previously noted (E. S. R., 29, p. 761); (5) Warble Flies: New Investigations of the Life History of Both Ox Warble Flies, by H. Gläser; and (6) Warble Removal Experiments in the Neuhaus an-der-Oste District in April, 1913 (pp. 3-16), and Warble Removal in Ollenburg in 1913 (pp. 17-25), by Schöttler and H. Gläser, and Experiments Which Show That the Warble Larvae Cause a Loss of Flesh of Cattle, by H. Gläser (pp. 26-31).

Bacteria in the intestinal tract of calves, H. KÜTNIK (Centrl. Blt., [abz.], 1. Abt., Orig., 76 (1915), No. 6, pp. 409-414, figs. 10; abs. in Internat. Inst. San. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 11, pp. 159, 1501).—The author finds three forms to be constantly present in the intestinal tract of suckling calves, namely, *Bacillus acidophilus polymorphus*, *B. coli*, and *B. mesentericus*.

An extensive bibliography relating to the subject is included.

Hog cholera and its prevention, R. R. BUCH (Cornell Vet., 6 (1916), No. 2, pp. 90-111, pls. 11).—This article discusses the subject of hog cholera in general, the preparation of serum at the New York State Veterinary College, serum treatment, and the use of serum in the field.

Hog cholera in Cuba, B. M. BOLTON (Estac. Expt. Agron. Cuba Bol., 26 (1916), pp. 22).—A general account of "Pintadilla" or hog cholera and preventive measures.

Poisoning by *Lathyrus sativus*, SZCZEPANSKI (Abs. in Vet. Rec., 27 (1915), No. 1392, p. 478).—A report upon the poisoning of two horses by *L. sativus* present in oats and peas with which they were fed. The feeding of the peas was stopped at once upon discovery of the cause but nevertheless two weeks later all the other horses in the stable, of which there were ten, developed the symptoms. Two horses are said to have died from the poisoning.

Contagious abortion in mares, G. SOMENZI (Clin. Vet. [Milan], Russ. Pol. Sanit. e Ig., 38 (1915), No. 5, pp. 206, 207; abs. in Vet. Rec., 27 (1915), No. 1395, p. 565).—A report of two outbreaks of this disease in which a bacillus belonging to the paratyphoid B group was isolated at the Milan Station for Infectious Diseases.

Arsenical preparations in the treatment of equine pectoral influenza, REIMERS (Berlin. Tierärzt. Wochenschr., 31 (1915), No. 37, pp. 433-436; abs. in Clin. Vet. [Milan], Russ. Pol. Sanit. e Ig., 39 (1916), No. 1, p. 14; Vet. Rec., 35 (1916), No. 1443, p. 400).—Of 83 cases treated with neosalvarsan, some of which were seriously affected, but one succumbed during treatment and in this case the treatment was commenced too late. The neosalvarsan was used in doses

of 4.5 and of 3 gm., which were mixed respectively with 120 gm. and with 100 gm. of a sterile 0.4 per cent solution of sodium chlorid and administered by intravenous injection. No abnormal lesions were observed to have been caused by the injection. Other similar preparations, including atoxyl, plasmarsin, and arslusolvin, did not give as good results. It is concluded that neosalvarsan is the best remedy for pectoral influenza and that it gives 100 per cent of recoveries when used in time.

Epitheliosis infectiosa avium. Contagious epithelioma. Chicken pox. Diphtheria. Roup. Canker. O. V. BRUMLEY and J. H. SNOOK (*Vet. Alumni Quart. [Ohio State Univ.]*, 3 (1916), No. 3, pp. 81-98).—The authors' bacteriological experiments and the satisfactory results obtained from vaccination led them to conclude that they have been dealing with a single disease. The confusion in names has led them to designate the affection as infectious epitheliosis of birds (epitheliosis infectiosa avium).

"Work extending over a period of six years convinces us that typical infectious epitheliosis is due to a combination of two factors: (a) A filterable virus; (b) secondary invading organisms which vary in kind but of which the so-called *Bacillus diphtheriae columbarum* of Loeffler appears to be the most important. The filterable virus is the necessary primary invader which lowers the bird's resistance and thus prepares the tissues for the invasion by the secondary organisms. Neither factor alone will cause the typical disease.

"The excellent results derived from the use of a vaccine made from the secondary organisms, both in prevention and treatment, are due to controlling the secondary infectious which cause the serious complications. If these are controlled infection due to the primary virus is mild and soon disappears. (There is a remote possibility that the filterable virus is contained in the vaccine. We have no evidence that this is or is not the case. The presence of the virus in the vaccine would indicate its growth with the other organisms on the cultures. This would be contrary to our present knowledge of filterable viruses. This point will be investigated.)

"The therapeutic dose, as indicated by the large number of birds treated, is 1 cc. for the average adult bird. Younger and smaller birds receive a lesser amount. The immunizing dose found most satisfactory is 1 cc. No bad results have followed when larger doses have been administered. Reports received to date indicate that vaccination is equally efficacious in the treatment of infectious epitheliosis in turkeys."

Spontaneous and experimental leukemia of the fowl. H. C. SCHMEISSER (*Jour. Expt. Med.*, 22 (1915), No. 6, pp. 829-838).—"The spontaneous occurrence of myeloid leukemia of the fowl is confirmed. Myeloid leukemia of the fowl is transmissible by intravenous or intraperitoneal injection of an organic emulsion.

A report upon an outbreak of fowl typhoid, W. J. TAYLOR (*Jour. Amer. Vet. Med. Assoc.*, 49 (1916), No. 1, pp. 35-49).—This is a report of investigations of fowl typhoid during the course of an outbreak in California which led to the following conclusions:

"Fowl typhoid is a specific disease of fowls caused by *Bacterium sanguinarum* occurring sporadically and causing heavy losses among affected flocks, and unless properly investigated may easily be mistaken for fowl cholera because of its high mortality. The specific morbid conditions consist of an enlarged liver containing necrotic areas, an enlarged spleen, and a general anemic condition of the serous and mucous membranes, together with a marked increase in leucocytes and a corresponding decrease of the red cell content of the blood. The increase in leucocytes seems to be confined to the polymorphonuclear variety. Fat, well-conditioned adult fowls are more susceptible than young, nearly mature growing birds.

"Birds may contract the disease by the ingestion of pure cultures of *B. sanguinarum*. Birds fed upon the offal of other birds dead of this disease show a mild nonfatal form of the disease tending to recovery. There is evidence that recovery from this mild form produces more or less of an immunity. Further investigation upon this point is needed.

"The power of some of the red corpuscles of the affected fowls to take the violet stain when the blood is diluted in Tolsson's fluid is especially noticeable in this disease. While the lesions produced in fowls which are infected with *B. sanguinarum* resemble in many respects those produced by *B. pullorum*, and although there is a still closer resemblance in the biological characters of the two organisms, there is enough difference to warrant the conclusion that they are distinctly different diseases."

The rearing of turkeys with special reference to the blackhead disease P. B. HAMLEY (*R. I. State Col. Ext. Bul. 2, n. ser. (1916), pp. 20, figs. 21*).—A general discussion of the subject in which is pointed out the importance of controlling by suitable methods of feeding the development of parasites in the intestinal canal and of preventing the invasion of the tissues.

Diseases of poultry. W. CHENEVARD (*Maladies des Volailles. Paris: J. B. Baillière & Sons, 1916, pp. 90, figs. 27*).—A small handbook.

RURAL ENGINEERING.

Fourteenth annual report of the Reclamation Service, 1914-15 (*U. S. House Representatives, 64th Cong., 1st Sess., Doc. 38, pp. VII+521*).—This report relates in particular to work completed and in progress during the fiscal year ended June 30, 1915, but contains also information in regard to previous operations to show the methods, progress, and results of reclamation work.

Classification of expenditures for irrigation work. F. H. NEWELL (*Enns and Contract., 45 (1916), No. 9, pp. 201-203*).—Expenditures for operation and maintenance of irrigation systems are classified and discussed under five general heads, as, (1) development, (2) carriage, (3) distribution, (4) drainage and flood protection, and (5) structure depreciation. Ways of obtaining efficiency and economy in recording and classifying expenditures on such a basis are pointed out.

Irrigation districts in California, 1887-1915. F. ADAMS (*Cal. Dept. Engrs. Bul. 2 (1916), pp. 151, pls. 15*).—This report is based on data gathered from 1900 to time during the past 15 years in cooperation with the U. S. Department of Agriculture. Its main divisions deal with the original Wright Act of 1887, the irrigation district act of 1897, irrigation district legislation since the act of 1897, the status of California districts July 1, 1915, and court decisions affecting California irrigation districts. Appendixes are included giving (1) a statistical list of California irrigation districts organized under the Wright Act, (2) a list of irrigation districts proposed under that act for which organization was not completed, (3) a list of irrigation district cases affecting California irrigation districts and subjects dealt with in decisions, and (4) an account of the California irrigation district act of 1897 as amended to 1915.

Water resources of Illinois. A. H. HOKKON (*Springfield, Ill.: Rivers and Lakes Com., 1914, pp. VIII+400, pls. 20, fig. 1*).—This report, prepared in cooperation with the U. S. Geological Survey, contains data on stream flow, precipitation, evaporation, drainage, and undeveloped water power and water storage in Illinois. It includes stream profiles, rainfall records, and maps prepared by the Weather Bureau of the U. S. Department of Agriculture; a map of Illinois streams; and an appendix, by G. B. HILLS, on developed water power and drainage districts of Illinois.

Report on Pit River basin, E. G. HOPSON and O. W. PETERSON (*Cal. Cooper. Work, Dept. Int. U. S. Reclamation Serv., 1915, Apr., pp. 140, pls. 19*).—This report deals with investigations made in 1914 and 1915 by the U. S. Reclamation Service and the State of California, acting in cooperation, of run-off, storage possibilities, lands, irrigable areas, present uses of water, and power development possibilities of an area including 6,000 square miles in northeastern California which consists of both mountainous and plateau country.

Among the conclusions from this investigation are that in the Pit River basin there are about 180,000 acres of potentially fertile, irrigable land, of which about 40 per cent is now fully or partially irrigated. Of the areas now irrigated only an insignificant proportion is well developed agriculturally, due in large part to unregulated water supplies and to unsatisfactory drainage conditions. Lands in Fall River Valley can be advantageously irrigated by pumping, the supply being practically inexhaustible, while lands adjacent to and in the vicinity of Hat Creek, that are not yet irrigated, can be readily irrigated by direct diversion without storage. Irrigation development in the Pit River basin will not seriously interfere with future power development in or below the basin, or with the navigability of the river. Floods in the Sacramento Valley can not be controlled by storage in the Pit River basin.

Silver Lake project: Irrigation and drainage, J. T. WHISTLER and J. H. LEWIS (*Oreg. Cooper. Work, Dept. Int. U. S. Reclamation Serv., 1915, Oct., pp. 179, pls. 27*).—This report, prepared in cooperation with the State of Oregon, deals with the irrigation and water-power possibilities of the Silver Lake region, Lake County, Oreg., together with the reclamation of Silver Lake and Paulina Marsh by drainage and pumping.

The features to which this report has special reference are: (1) The irrigation of lands about Silver Lake and Fort Rock by storage of about 60,000 acre-feet of water at Thompson Valley, into which diversion canals from Sycan River and Long and Coyote creeks will divert the spring run-off from these streams. . . . (2) The reclamation and irrigation of about 9,000 acres of Paulina Marsh by storage on lower Buck Creek at the Emory reservoir site and a drainage canal through the marsh to Silver Lake. . . . (3) The possible development of summer power on Silver Creek from Thompson Valley storage for use in pumping to reclaim part of Silver Lake bed; in pumping from ground water to supply additional lands in Fort Rock Valley; and in pumping from Ana River Springs for the irrigation of about 20,000 acres of land in Summer Lake Valley. . . .

"Conditions for the development of the proposed project to irrigate 48,600 acres are exceptionally favorable to development by stages. . . .

"Considerations of available water supply, extent of irrigable lands, and possibilities of irrigation by economic use of water, together with careful cultivation of land and distribution by rotation, have led to adopting for the proposed project a water duty of 1 acre-foot delivered per acre of irrigable land.

"The soils over the larger portion of the project appear to be those of old lake beds and terraces. They are generally free working loams that readily mulch, yet with fine enough material in the subsoils to have good water retaining capacities. Chemical analyses show them to be reasonably fertile in phosphorus and potash and to have medium nitrogen content. The alkali content is comparatively small."

It is estimated that the mean run-off for lower Silver Creek for the past 12 years is 40,400 acre-feet.

Irrigation experiments, G. K. KELKAR (*Dept. Agr. Bombay, Ann. Rpt. Expt. Work Surat Agr. Sta., 1913-14, pp. 36-38*).—In irrigation experiments with

cotton, sorghum, and tur (pigeon peas), the irrigated plats showed superiority in yield over nonirrigated plats in a dry year, but the irrigation did not "financially show any benefit from the economic standpoint."

Venturi meter developed for accurate measurement of irrigation water. A. A. WOOD (*Engin. Rec.*, 73 (1916), No. 13, pp. 411-413, figs. 3).—A recording device, applying the Venturi meter principle, is described which is designed to establish rates on an equitable basis for water users. It is thought that by its use the flat-rate system of charges may be eliminated.

Swamp-land drainage with special reference to Minnesota, B. PALMER, (*Univ. Minn., Studies Soc. Sci.*, No. 5 (1915), pp. 133).—This report contains a brief statement relative to the drainage work in foreign countries, the extent of land needing drainage in the United States, drainage laws and development of drainage legislation in Minnesota, drainage procedure, and the extent of swamp-land reclamation in Minnesota. As an appendix is given the drainage statutes of various States and references to drainage cases in the Minnesota Supreme Court. A statistical table showing the land in need of drainage, the area drained, and the cost and average net profit per acre as result of drainage, together with a brief bibliography, is included.

Land bedding as a method of drainage in the Gulf coast region of Texas. E. W. GROSS (*Agr. and Mech. Col. Tex. Ext. Serv. Bul.* B-11 (1915), pp. 61).—This method is briefly described.

Tile drainage by day labor and by the rod (*Engin. News*, 75 (1916), No. 19, pp. 450-452, figs. 5).—This article describes a land drainage system on the Mississippi River built for three landowners jointly, the work being done by day labor under the direction of the engineer.

Experiments with the automatic water finder in the trap region of western India. H. H. MANN (*Dept. Agr. Bombay Bul.* 72 (1915), pp. 17, pls. 3).—The results of the experience of others along this line are noted and tests are reported of a so-called automatic water finder.

This finder consists of a wooden case divided into two chambers, the lower containing coils of wire wound on a bobbin, and the upper, at the center, a pivot on which rests a light magnetic needle, which, by its movements, is supposed to detect underground streams. With the instrument are provided a tripod stand and a table on which the instrument is to be placed while taking an observation. On the table there is a white line which is always to be directed toward the magnetic north while using the instrument. "It is obvious that what the instrument detects is not the stream of water, but some electric condition which accompanies that stream."

The results of a large number of tests at different places indicated that "where a stream of water is known to exist the indications of the instrument are by no means constant and the deflection of the needle may vary in direction as well as in amount."

... It would seem, however, sufficiently proved that under the conditions which prevail in the trap areas of western India, where underground water occurs in well-defined streams flowing in rock fissures, sometimes under lithic or no pressure and sometimes under considerable pressure, the automatic water finder can be used with advantage in locating streams of water which can be tapped either by well digging or by boring."

The conditions affecting the accuracy of the instrument and the precautions to be observed in its use are explained.

Investigation of the pollution and sanitary conditions of the Potomac watershed, H. S. CROMBIE ET AL. (*Pub. Health Serv. U. S., Hyg. Lab. Bul.* 164 (1916), pp. 231, pls. 59).—This report is the result of an investigation of the pollution of the Potomac River and its tributaries begun June 2, 1913, and

continued until May 31, 1914. The investigation included a sanitary survey of the Potomac River watershed and laboratory studies of the water, mud, plankton, and shellfish. The sanitary survey included investigations as to the number of persons on the watershed, the prevalence and distribution of typhoid fever, the water supplies, sewage disposal systems, and character and amounts of trade wastes.

It was found "that at no point above Washington is the water of the Potomac River safe for use as a public water supply without reasonable treatment. . . . At no time was the condition over and about the Washington sewer outlet such as to constitute a nuisance. Even during the period of lowest stream flow and highest temperature the river in the area of heaviest pollution . . . has at all times sufficient oxygen available for the sewage now discharged into the river and enough to take care of the sewage which will probably be added for several years to come. In addition to the dissolved oxygen contained in the water of the river as it flows from the Great Falls, the great areas of flats on each side of the river for many miles act as oxygen generators. The amount of oxygen given off, depending in part upon the condition of plant life, turbidity, and sunshine, is, therefore, greatest during the summer when there is the most need for it. In addition to releasing enormous volumes of oxygen these flats are breeding places for plankton forms, which themselves materially assist by biological processes in the breaking down of sewage and the consequent purification of the river. . . . Few intestinal organisms from above reach Maryland Point, and these disappear in the stretch of 10 miles between that point and Popes Creek, at which section evidence of pollution from the upper river has disappeared.

"In an examination of oysters from all the beds in the whole river and its tributaries, extending over an entire season, no dangerously polluted oysters were found in the Potomac River proper. . . . Analysis of the results obtained during the year in the examination of shellfish and of water taken from over the oyster beds shows that the periods of highest *Bacillus coli* count in the two were not coincident." . . .

Tests of bacteriological methods are also reported in some detail. As a result of these studies it is recommended that the lactose bile presumptive test be not used, because of the unreliable results obtained therefrom; and that the use of lactose broth fermentation tubes, with confirmation on endo medium, be adopted as a routine procedure in the examination of water and shellfish for the determination of the presence of *B. coli*.

Analyses of waters, J. C. BRENNIE (Ann. Rpt. Dept. Agr. and Stock [Queensland], 1914-15, pp. 50-52).—Analyses of 65 samples of Queensland waters are reported and discussed with reference to their use for domestic, stock-watering, and irrigation purposes.

Results of first year's experiments with small sewage treatment plants by U. S. Public Health Service, L. C. FRANK (Engin. and Contract., 45 (1915), No. 18, pp. 420-422).—The results of experiments with the Inhoff tank and sand bed combination for use on a small scale are reported, from which the following conclusions are drawn:

"It is possible by means of a five-hour mean detention period in a properly designed Inhoff tank to remove from the raw sewage of small communities 98 per cent of the settleable solids without producing a nuisance. A mean detention period of six hours, based on the average daily flow, will not cause the sewage to become septic or foul smelling if it is fresh when it enters the tank. The accumulation of a disagreeable mass of grease and fecal matters in the first compartment of the settling chamber may be prevented by the introduction of a horizontal coarse mesh screen at the water level of this chamber. The screen

keeps the floating matters submerged and apparently results in all fecal matter sooner or later becoming water-logged and sinking through the slot into the sludge chamber. It is too soon to state with conviction the amount of digested sludge that may be expected from small-scale tanks, but one tank indicates an apparent accumulation of 2.6 cu. ft. per year per person and another tank 4 cu. ft. The only period during which the Imhoff tanks required daily attention was the foaming period, which lasted about ten days, and during which time some of the foam had to be removed and buried. At all other times attention once a month at the most was ample. Since the foaming period has been passed the scum formation has been slight.

"The decomposed sludge obtained from the small-scale Imhoff tanks resembled that obtained in large tanks except that it had a much higher moisture content. This may perhaps be explained by the shallowness of the sludge layer. A 15-in. sand bed dosed with settled sewage at a net rate of 100,000 gal. per acre per day during the second summer reduced an average oxygen demand of 63 parts per million to 12 parts per million (24 hours, 20° C.). This is probably ample purification for many cases, but insufficient for others. The sand bed required very little attention during the summer months, but what would seem to be a prohibitive amount of attention during the winter months, even though covered with a tongue-and-groove wooden cover. No nuisance was produced during the summer months by the dosing of the uncovered sand bed with the Imhoff tank effluent. The growth of weeds on the sand surface did not seem to have an unfavorable effect upon the operation of the sand bed."

A practical process for the sterilization and utilization of polluted water in the field, ROLLAND (*Jour. Pharm. et Chim.*, 7, ser., 12 (1915), No. 6, pp. 178-182, fig. 1; *abs. in Chem. Abs.*, 10 (1916), No. 2, p. 236).—Water in a barrel is treated with a sufficient excess of calcium hypochlorite of known strength to impart a distinct chlorine taste. It is next passed into a large funnel containing absorbent cotton, and then upon a perforated disk with alternate layers of finely powdered charcoal, fine sand, powdered charcoal, coarse sand, wood charcoal, crushed stone, and straw to distribute the water.

Dams and weirs, W. C. BUGH (*Chicago: Amer. Tech. Soc.*, 1915, pp. [VIII] + 206, figs. 124).—This is an analytical and practical treatise on gravity dams and weirs, arch and buttress dams, and submerged weirs and barrages. It contains the following chapters: Gravity dams, design of dams, unusually high dams, notable existing dams, special foundations, gravity overfall dams or weirs, arched dams, multiple arch or hollow arch buttress dams, hollow slab buttress dams, submerged weirs founded on sand, and open dams or barrages.

Good roads of Monroe County, New York, 1915, J. Y. MCCLINTOCK (*Roadmaster*, N. Y.: Co. Supt. Highways, 1915, pp. 48, pl. 1, figs. 36).—This is a report of the county superintendent of highways for 1915, giving tabulated statements of expenditures for highway purposes during the year and calling attention to the more important features of the work.

Fourteenth annual report of the state board of public roads of the State of Rhode Island (*Ann. Rpt. Bd. Pub. Roads R. I.*, 14 (1916), pp. 691).—This is a report of expenditures on road and bridge work in the State for 1915.

Surface oiling of earth roads, B. H. PIEPMER (*Ill. Highway Dept. Bul.*, 1 (1915), pp. 28, figs. 26; *Sci. Amer. Sup.*, 81 (1916), No. 2102, pp. 250, 251).—It is the purpose of this publication to present as many facts concerning the use of oil as it is possible to secure at this time, also to describe what is shown by experience to be the best method of preparing the road and applying the oil together with a few suggestions that may be of some assistance to the contractor or individual who has such work under consideration.

"Roads should not be oiled until they have a permanently established grade. . . . Low, flat, undrained roads should not be oiled until proper drainage has been attended to. . . . Roads that have a preponderance of heavy hauling should not be selected for oiling. . . . The main purpose of oiling earth roads is to suppress the dust and aid in maintaining a smooth and waterproof surface. . . .

"It is very important that the road surface be oiled when it is smooth, free from dust, and in a condition to absorb the oil. . . . Best results may be expected when the road is reasonably dry for about 2 in. on the surface. . . . The oil should be applied at the rate of from $\frac{1}{4}$ to $\frac{1}{2}$ gal. per square yard of surface. If the road has never been oiled, or if more than a season has elapsed since a previous oiling . . . about $\frac{1}{2}$ gal. per square yard will be required. If the road or street has been oiled regularly, from $\frac{1}{4}$ to $\frac{1}{2}$ gal. per square yard will usually be satisfactory. . . . After a road has been oiled for several years, one light application each year may be sufficient, or at least equal in results to two applications per year on a new oiled road. . . .

"The uniform distribution of the material is one of the essential requirements for success. . . . Better results can be secured from sanding the road slightly after either hot or cold oil has been applied. . . . A hot oil application should be followed with a light dressing of sand . . . at a rate of 1 cu. yd. to each 100 to 150 sq. yds. of road surface. . . . It seems essential that careful analysis be made of all road oils before using and that preference be given to the natural and semiasphaltic products over the paraffin oils."

Other general information regarding the oiling of sand and gravel and macadam roads is given.

Popular handbook for cement and concrete users, M. H. LEWIS and A. H. CRAMER (*New York: The Norman W. Henley Publishing Co., 1911, pp. 11+330, figs. 126*).—This is a comprehensive and popular treatise on the principles involved and the methods employed in the design and construction of modern concrete work, covering both plain and reinforced concrete.

It contains the following chapters: Kinds of cement and how they are made; properties, testing, and requirements of hydraulic cements; concrete and its properties; sand, broken stone, and gravel for concrete; how to proportion the materials; how to mix and place concrete; forms for concrete construction; the architectural and artistic possibilities of concrete; concrete residences; mortars, plasters, and stuccos and how to use them; the artistic treatment of concrete surfaces; concrete building blocks; the making of ornamental concrete; concrete pipes, fence posts, etc.; essential features and advantages of reinforced concrete; how to design reinforced concrete beams, slabs, and columns; explanation of the theory of the design of reinforced concrete beams and slabs; systems of reinforcement employed; reinforced concrete in factory and general building construction; concrete in foundation work; concrete retaining walls, abutments, and bulkheads; concrete arches and arched bridges; concrete beam and girder bridges; concrete in sewerage and drainage works; concrete tanks, dams, and reservoirs; concrete sidewalks, curbs, and pavements; concrete in railroad construction; the utility of concrete on the farm; the waterproofing of concrete structures; grout or "liquid concrete" and its uses; inspection of concrete work; a summary of essential rules and principles of construction for securing good concrete work; and cost of concrete work.

Concrete on the farm and in the shop, H. C. CAMPBELL (*New York: The Norman W. Henley Publishing Co., 1916, pp. 149, figs. 51*).—This is a popular treatise on the fundamental principles of concrete construction with particular reference to farm structures. It contains the following chapters: Gea-

eral summary of concrete principles; aggregates; principles of proportioning; mixing concrete; placing concrete; protection after placing; cold weather concreting; recommended mixtures; forms; concreting tools; foundations; principles of reinforcing; materials for reinforcing; walls and fences; posts; rubble concrete; tanks and troughs; cisterns; form removal; hog wallow; manure pit; repairs of leaks in tanks, etc.; hotbeds; roofs for small buildings; pavements, feeding floors, and walks; steps; and well curbs and plan-forms.

Tests of three large-sized reinforced-concrete slabs under concentrated loading, A. T. GOLDBECK and E. B. SMITH (*U. S. Dept. Agr., Jour. Agr. Research*, 6 (1916), No. 6, pp. 205-234, pl. 1, figs. 28).—Tests of three large reinforced-concrete slabs to determine their effective widths under concentrated loading as defined by McCormick (*E. S. R.*, 33, p. 487), and "to demonstrate the application of the theory of narrow rectangular beams to the design of wide slabs supported at two ends and subjected to concentrated loads," are reported. All three slabs were 32 ft. wide, of 16 ft. span, and reinforced but not transversely, made of machine-mixed 1:2:4 concrete. A complete description of the slabs is given in the following table:

Description of reinforced-concrete slabs used in tests.

Thickness.		Reinforcing.			Modulus of elasticity of concrete.	Central breaking load of slab.
Total.	Effective.	Size.	Spacing.	Percent.		
Inches.	Inches.	Inches.	Inches.			Pounds.
12	10½	¾ (plain square).	10.5	0.75	2,900,000	119,000
10	8½	¾ (plain square).	8.87	.75	4,300,000	80,000
7	6	¾ (plain square).	5.50	.75	3,000,000	40,000

The data of results are graphically reported.

It was found that "with an increase in load the effective width seems to increase slightly. Values for effective width were obtained from the steel deformations as well as from the concrete deformations, but . . . the concrete deformations gave the most conservative widths. . . . As the thickness increases the effective width decreases, varying from 100 per cent of the span length for a 6-in. slab to 75 per cent of the span for a 10½ in. slab. The low value for effective width shown by these tests is roughly, then, about 0.7 of the span length. . . . It would seem that under extremely heavy loads, requiring very thick slabs, the effective width might be decreased as low, possibly, as 0.6 of the span length. However, 0.7 of the span will always be safe, and in general is a sufficiently conservative figure to use."

The effective widths of the spans tested are given in the following table:

Effective widths of reinforced-concrete slabs, 16-ft. span by 32 ft. wide, under center loading.

Center load.	Slab 10½ in. effective thickness.	Slab 8½ in. effective thickness.	Slab 6 in. effective thickness.
Pounds.			
15,000	11.6 ft. = 72.3 per cent of span.	11.4 ft. = 71.6 per cent of span.	12.7 ft. = 79.5 per cent of span.
20,000	11.5 ft. = 71.9 per cent of span.	13.0 ft. = 81.2 per cent of span.	17.5 ft. = 109.3 per cent of span.
25,000	12.1 ft. = 75.7 per cent of span.	12.9 ft. = 81.1 per cent of span.	
32,500		14.5 ft. = 90.7 per cent of span.	
35,000			
Safe load.	12.1 ft. = 75.7 per cent of span.	12.9 ft. = 81.1 per cent of span.	17.5 ft. = 109.3 per cent of span.

"The usual rectangular-beam design formulas may be applied to the design of slabs by merely substituting for b its value as determined by these investigations, $b=0.7L$. The corresponding formulas then become—

For rectangular beams.

For slabs under central concentrated loads.

$$(1) M_s = \frac{1}{2} f_s k j b d^2.$$

$$M_s = \frac{1}{2} f_s k j \frac{7}{10} L d^2.$$

$$(2) M_s = p f_s j b d^2.$$

$$M_s = p f_s j \frac{7}{10} L d^2.$$

$$(3) p = \frac{a_s}{b d}$$

$$p = \frac{10 a_s}{7 L d}$$

$$(4) p = \frac{1}{f_s} \left(\frac{f_s}{n_0} + 1 \right)$$

$$p = \frac{1}{f_s} \left(\frac{f_s}{n_0} + 1 \right)$$

$$(5) k = \sqrt{2 p n + (p n)^2} - p n.$$

$$k = \sqrt{2 p n + (p n)^2} - p n.$$

"It is interesting to note that in substituting for M_s and M_c in formulas 1 and 2 their value $\frac{PL}{4}$ the L 's cancel, showing that the safe load-carrying capacity of the slab is independent of the span; thus

$$1 \text{ becomes } \frac{PL}{4} = \frac{1}{2} f_s k j \frac{7}{10} L d^2 \quad \text{or} \quad P = \frac{7}{5} f_s k j d^2.$$

$$2 \text{ becomes } \frac{PL}{4} = p f_s j \frac{7}{10} L d^2 \quad \text{or} \quad P = p \frac{14}{5} f_s j d^2.$$

"The above investigations were made on slabs the width of which was twice the span length, so that the stress at the extreme edges was very small. The conclusions must therefore be applied to such cases only. When the ratio of width of slab to span length is less than 2, these conclusions may or may not apply, and additional investigations are now being made to determine the proper value of effective width to use under such conditions."

The action of Portland cement mortar in different salt solutions. V. Röm. Mitt. 8. *Materialprüfungsamt Berlin-Lichterfelde West*, 33 (1915), No. 3-4, pp. 229-240.—Tests to determine the influence of solutions of sodium, calcium, and magnesium chlorides and sulphates in concentrations of 0.1, 1, and 10 per cent on Portland cement mixtures with sand, 1:3 and 1:6, when immersed in the solutions for periods as long as six months, showed that none of the solutions except that of calcium sulphate had an injurious effect on the 1:3 mixture. Calcium sulphate, on the other hand, showed evidences of a destructive influence. With the 1:6 mixture only the sulphate solutions had a destructive effect, but this was, however, very marked. The action was very arbitrary and irregular. The chlorides of calcium and magnesium produced an increase in the leaching out of lime from the cement, especially when the salt solutions were concentrated and the cement mixture lean.

Further studies are in progress on the effect of leaching solutions.

Some tests on hydrated lime addition to concrete for road work. E. AUSTON (*Engin. and Contract.*, 45 (1916), No. 9, pp. 266, 267).—Tests are briefly reported in which 5, 10, and 15 per cent by weight of hydrated lime was added to concrete.

The results showed that "no greater freedom of movement of the mass was noticed. As the lime was increased more difficulty was experienced in getting the material into the test forms. . . . With same angle and same percentage of water concrete did not flow more readily by the addition of hydrate of lime.

and as the percentage of hydrate of lime was increased the mass became more sticky and did not flow so readily. By far the most important observation made was that the addition of hydrate of lime did prevent segregation, and so much so as to make this the biggest gain that can be gotten from the use of hydrate of lime."

Experiments on wire rope, M. RUDELOFF (*Mitt. K. Materialprüfungsamt Berlin-Lichterfelde West*, 33 (1915), No. 3-4, pp. 198-209, figs. 10).—Experiments on the strength of four wire ropes gave inconclusive results. Experiments on the durability of three wire ropes containing, respectively, 294, 216, and 294 wires of 0.7, 0.63, and 0.59 sq. mm. cross section and having respective total wire cross sections of 113.1, 76.3, and 80.4 sq. mm. and total diameters of 20, 17, and 17 mm., are also reported. The second rope was found to be the most resistant and the third the least resistant.

Consideration on hauling by animal and mechanical power, F. ACHMANN (*Wehnschr. Brau.*, 32 (1915), Nos. 7, pp. 49-53, figs. 6; 8, pp. 62-64, figs. 2; 9, pp. 88-90, figs. 2).—The results of an investigation into the factors affecting the efficiency and economy of hauling loads by animal power and by motor truck are reported in both tabular and graphic form and analyzed to determine the limits of the efficiency and economy of the two types of power under different conditions.

A final graphic comparison of the cost of hauling by the two kinds of power is made which is based on the cost per ton kilometer and the daily accomplishment in ton kilometers. This comparison shows that up to a daily accomplishment of about 200-ton kilometers animal power hauling one wagon for 100-ton kilometers per day and two wagons for from 100 to about 200 ton kilometers per day is more economical than one motor truck of 2 tons capacity. With a daily accomplishment of from 200 to 700 ton kilometers it is shown that the motor truck alone in varying capacities or a train of motor trucks is more economical than a train of from three to eight wagons drawn by animal power.

An economic study of the farm tractor in the corn belt, A. P. VERNES and L. M. CHURCH (*U. S. Dept. Agr., Farmers' Bul.* 719 (1916), pp. 24, fig. 1).—This bulletin reports and discusses data from selected reports from over 200 tractor owners in Illinois whose farms are typical of corn-belt conditions, the data being considered correct for conditions existing in the corn belt in the spring of 1916.

The principal points brought out by the experience of these owners are summarized as follows:

"The chief advantages of the tractor for farm work, in the opinion of the operators, are (1) its ability to do the heavy work and do it rapidly, thus covering the desired acreage within the proper season; (2) the saving of man labor, and the consequent doing away with some hired help; and (3) the ability to plow to a good depth, especially in hot weather. The chief disadvantages are difficulties of efficient operation and the packing of the soil when damp.

"The purchase of a tractor seldom lowers the actual cost of operating a farm, and its purchase must usually be justified by increased returns.

"One of the most important points in connection with the purchase of a tractor is to obtain one of suitable size for the farm on which it is to be used. In this connection experienced tractor owners in Illinois make the following recommendations:

"For farms of 200 crop acres or less, the 3-plow tractor; for farms of from 201 to 450 crop acres, the 4-plow tractor, with the 3-plow outfit second choice; for farms of from 451 to 750 crop acres, the 4-plow tractor, with the 5- and 8-plow outfits tied for second choice; a farm of 140 acres is the smallest upon which the

smallest tractor in common use, the 2-plow outfit, may be expected to prove profitable.

"Medium-priced tractors appear to have proved a profitable investment in a higher percentage of cases than any others.

"The life of tractors, as estimated by their owners, varies from 6 seasons for the two-plow to 10½ seasons for the 6-plow outfits. The number of days a tractor is used each season varies from 49 for the 2-plow to 70 for the 6-plow machines. No definite figures on the repair charges for late model tractors can be given; it would not seem safe, however, to count upon less than 4 per cent of the first cost annually (this representing the average for farm machinery in general).

"Under favorable conditions a 14-inch plow drawn by a tractor covers about 3 acres in an ordinary working day. Under unfavorable conditions large gang plows will cover less ground per day per plow pulled than will the small ones. Two and one-half gal. of gasoline and 0.2 gal. of lubricating oil are ordinarily required in actual practice to plow 1 acre of ground 7 in. deep. The size of the tractor has little influence on these quantities.

"Plows drawn by tractors do somewhat better work, on the whole, than horse-drawn plows. In Illinois the depth plowed by tractors averages about 1.5 in. greater than where horses are used. Efficient operation is essential to success with a tractor, and proficiency usually can be obtained more cheaply and easily by previous study and training than by experimenting with one's own tractor. With a proficient operator the tractor is a very reliable source of power.

"The use of the tractor for custom work is usually an indication that the home farm is not large enough to utilize it economically. The doing of custom work with the tractor, on the whole, appears to be a questionable practice, although nearly 45 per cent of machines are used for such work to some extent.

"A tractor displaces on an average about one-fourth of the horses on the farm where it is used. On a large number of Illinois farms brood mares constituted 35 per cent of the work stock before the purchase of the tractor. The use of the tractor increased this proportion only 3 per cent. . . . Both increases and decreases in the crop yields are reported from the use of the tractor, although favorable effects are more common than unfavorable. However, increases are not sufficiently frequent to warrant a farmer placing much dependence on the tractor in this respect."

The economics of the farm tractor, E. R. WIGGINS (*Power Farming*, 25 (1916), No. 2, pp. 16, 45, 48, fig. 1; *Farm Implements*, 30 (1916), No. 2, pp. 58, 60, 62, 62A).—The results of an investigation conducted in Nebraska on tractor costs are reported in detail, three systems of tractor farm management being considered, namely, (1) private ownership, (2) cooperative management, and (3) custom operation.

It is concluded that a study of costs of tractor operation does not entirely indicate the advantages of tractor over horse farming since, while there is a saving in favor of the tractor, the added investment necessary must be considered. "The advantage, however, comes . . . in the added work that can be done with the tractor, at the same cost, and besides all this, the tractor does not use materials that man can use to reduce the cost of living."

The proper bearings for farm tractor uses, C. M. EASON (*Farm Machinery*, No. 1271 (1916), pp. 26, 27, fig. 1).—This article deals with different types of antifriction bearings, bearing loads, bearings for radial loads only, rollers *v.* balls, and size and capacity of bearing. Roller bearings are favored for tractors.

Indigenous implements of the Bombay Presidency, G. K. KELKAR (*Dept. Agr. Bombay Bul.* 66 (1914), pp. VI+100, pls. 26).—This is a general survey of the indigenous implements of the Presidency proper which include plows, harrows, clod crushers, seed drills, interculturing and weeding implements, harvest-

ing implements, threshing appliances, winnowing and cleaning appliances, appliances in the preparation of crops for the market, appliances for transport of agricultural products, implements used in improvement of land. Fodder, implements, mallas (a heavy rainfall tract of Karnatak) implements, tools, tools, water lifts, and yokes and hitching. Appendixes are included giving a glossary of vernacular words of crops, the kinds of wood used in the manufacture of implements with their scientific names, and vernacular names of different parts of implements with their English equivalents.

Directory and specifications of plows for tractor use (*Farm Machinery*, No. 1271 (1916), pp. 22, 23).—This list includes 91 of the types manufactured in the United States.

Proper use of rams for farm water supplies, W. G. KIRCHOFFER (*Engin. News*, 75 (1916), No. 10, pp. 457, 458, figs. 2).—The hydraulics involved in the design of a hydraulic ram system of water supply are briefly presented, together with a specific example.

Concrete silos, E. S. HANSON (*Chicago: The Cement Era Publishing Co.*, 1916, pp. 174, figs. 78; rev. in *West. Engin.*, 7 (1916), No. 2, pp. 78, 79; *Engin. News*, 75 (1916), No. 7, p. 319).—This book represents an attempt to compile and summarize the present available knowledge of concrete silo construction, and contains the following chapters: Why build a silo? what a good silo should be; how concrete meets the requirements; advantage over other kinds of silos; size and shape of a silo; the different types of concrete silos; the foundation of the silo; the monolithic silo; the Polk system; the Monoco system; the Reicher system; other monolithic systems; the pit silo; the metal lath silo; the concrete stave silo; the concrete block silo; doorways, doors, roofs, etc.; and how to increase the silo business. It is stated that part of the material was drawn from bulletins of the state agricultural experiment stations.

RURAL ECONOMICS.

The agricultural element in the population, E. MERRITT (*Quart. Rev. Amer. Statis. Assoc.*, n. ser., 15 (1916), No. 113, pp. 59-65).—Among the conclusions brought out in this paper, presented at the annual meeting of the American Statistical Association, Washington, D. C., December 20, 1915, are that the principal reasons for the decreasing percentage of the total workers employed in agriculture are that the agricultural element in the population is becoming more efficient, and that in the readjustment or changes in the methods of producing and distributing agricultural products agricultural people perform a smaller part of the complete operations than was the case formerly. As evidence of the increased efficiency are the facts that the agricultural workers are producing more crops per capita and use a smaller percentage of the total population for the purpose than formerly.

Another indication of the increased efficiency is the fact that the average number of acres of crops cultivated per agricultural worker is increasing and is accompanied by an increased number of horses on farms per acre of crops and by an increase in the average yields per acre.

The decrease in the agricultural and rural population in the north central States is due to a decreased number of farms and to smaller farm families.

The author states that anything that tends to upset the relationship between the supply and demand of labor in one field of endeavor sets in motion a migration from one part of the country to another or from one country to another, and that the relationships between the rural and urban populations are rendered unstable owing to differences in death rate, birth rate, and migration.

Although the fecundity of married women in rural districts is greater than those of the same nativity in urban districts, the presence of a larger number of foreign born in cities causes the relative birth rates to appear about equal. When the death rate is compared, age for age, it is found to be higher in the urban than in the rural districts, the difference being greatest at those ages at which the largest number of deaths occur. Even if the birth rate for rural and urban districts were the same, the greater death rate in cities results in a smaller percentage of those born in cities reaching the productive age periods. Migration from rural districts apparently begins with those 10 to 15 years of age, and practically ceases at 35 years of age. The higher death rate in cities accounts for the fact that a large percentage of those in rural districts survive.

He also points out that the white females are migrating from rural districts in greater numbers than males, and that their migration begins at an earlier age. The extensive use of agricultural machinery in the United States is probably the cause of this migration from rural districts. As long as the women are employed in the fields they contribute to the farm income. When an agricultural machine is introduced it not only takes away the field work of the farm women so that they become of less economic value on the farm, but it also makes them seek remunerative employment elsewhere.

Information for prospective settlers in Alaska, C. C. GEORGEON (*Alaska Nat. Circ. 1 (1916), pp. 30, pls. 5*).—This circular is based largely on the results of the station's work. It is estimated that in the whole Territory there are about 100,000 square miles which can be made available for tilling and for grazing purposes, but about one-half of this area has little value except for the latter purpose. General information is given concerning the climate, agricultural conditions, how to obtain a farm, chances for work and wages paid, transportation facilities, cost of living, crops and live stock, population, means of communication, etc.

An article by M. D. Snodgrass is included pointing out some of the problems confronting early settlers in the Matanuska Valley. Methods of clearing the land at present are various and crude, including grubbing with mattock and shovel, cutting some of the roots and lining with rope through a lead block, pulling stumps with homemade stump pullers, and burning during the dry seasons. The principal crops in this area are barley, oats, rye, potatoes, cabbage, turnips, rutabagas, carrots, tomatoes, cauliflower, beets, and most of the common garden vegetables. Wild fruits are abundant in this region, consisting of currants, blueberries, salmonberries, raspberries, gooseberries, cranberries, and a number of other edible sorts. The strawberries so common on the coast of southeastern Alaska are not found in the Matanuska country, but wherever planted they grow well.

Under the present homestead laws any person who has not used his homestead rights may take up 320 acres of land (160 acres in the National Forests) and acquire patent thereto by establishing his residence on the land and putting one-eighth of it under cultivation within three years after taking up the land. On the whole, the amount of land allowed is deemed more than the ordinary man can handle and comply with the laws; 160 acres being regarded as sufficient for the average person.

Statistics of the food supply in Germany, R. M. WOODBURY (*Quart. Pubs. Amer. Statis. Assoc., n. ser., 15 (1916), No. 113, pp. 93-109*).—This paper, read at the annual meeting of the American Statistical Association, Washington, D. C., December 29, 1915, is a review of discussions by various authors as to the possibilities of a decision of the European War being brought about by the starvation of Germany. After reviewing the literature the author concludes:

"There is little possibility that Germany can be starved. Her supplies are probably sufficient to cover the minimum practical requirement. Her food supply falls considerably short of the actual rate of consumption in 1912-13, and it must be conserved and carefully distributed to insure a sufficiency in the last months before the new harvests are available. There are distinctly less meat and animal products available than in normal times. The serious danger, it seems to me, is that disaffection may be spread among the working classes by restrictions on the consumption of foodstuffs, and above all by the increase in prices, which may seem to them entirely unnecessary if, as the government has announced, there is really enough food for all."

Settlement or employment on the land in England and Wales of discharged sailors and soldiers (*Final Rpt. Dept. Com. Land Settlement Sailors and Soldiers, 1915, pt. 1, pp. 30, pl. 1*).—In this report are considered methods of settlement, advisability of ownership and tenancy, selection and training of settlers, and provision for expert guidance and working capital.

The use of agricultural motors and machinery. D. H. GONIA (*Mem. R. Acad. Cien y Artes Barcelona, 3. ser., 12 (1915), No. 4, pp. 27*).—The author discusses the importance of machinery in the agricultural systems of various countries, its influence upon the relation of food supply to the population, and the relation of the use of machinery to the development of Spanish agriculture.

A farm management demonstration on 161 Chautauqua County farms for the year 1914. H. B. ROGERS (*Chautauqua Co. [N. Y.] Farm Imp. and Inform. Bur. Bul. 1 (1916), pp. 14, fig. 1*).—This bulletin gives a brief summary of the results obtained in a farm management survey of 161 Chautauqua County farms made in connection with the extension work of the county agricultural agent in 1914.

Marketing and farm credits (Madison, Wis.: *Nat. Conf. Marketing and Farm Credits, 1916, pp. 1X+531*).—This report consists of papers read at the third annual session of The National Conference on Marketing and Farm Credits in joint program with The National Council of Farmers' Cooperative Associations, in Chicago, November 29 to December 2, 1915. It deals with the following subjects: Organizing agricultural cooperation, marketing farm products, standardization of farm products, warehousing and standardization of farm products, local and terminal elevators, rural credit aids to land purchase, present facilities for land purchase and need of legislation, and financing the farm business.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Bul. 3 (1916), No. 16, pp. 32, fig. 1*).—This includes the usual list of farm products for sale, and brief discussions of the benefits that may accrue to the cotton farmers through organization in improving their products, establishing uniform grades of cotton, warehousing, and securing credit and better prices for their products. The text of an act passed in 1915 relating to the incorporation, maintenance, and supervision of credit unions and cooperative associations in North Carolina is also given.

Live stock shipping associations (*Wallaces' Farmer, 41 (1916), No. 19, p. 425*).—This article gives a brief description of a live stock shipping association formed at Farmington, Minn., together with the constitution and by-laws.

A system of accounts for primary grain elevators, J. R. HESSELMITH and W. H. KERR (*U. S. Dept. Agr. Bul. 362 (1916), pp. 30, pls. 3*).—Fifteen forms are given, with a description of their use for a system of accounts with an idea of establishing a uniform system for primary grain elevators. These forms are as follows: (1) Cash, journal, purchase, and sales record; (2) record of grain receipts; (3) record of grain purchases; (4) record of grain shipments and sales; (5) record of hedges; (6) record of sales to arrive; (7) patronage ledger

(for cooperative elevators); (8) grain and merchandise report; (9) manager's report; (10) grain check; (11) scale ticket; (12) storage ticket; (13) sales ticket; (14) cash receipt; and (15) cost analysis.

Agricultural statistics of Saxony, WÜRZBURGER (*Statist. Jahrb. Königl. Sachsen*, 42 (1914-15), pp. 104-129).—This continues information previously noted (E. S. R., 31, p. 96) adding data for 1913-14.

AGRICULTURAL EDUCATION.

Proceedings of the twenty-ninth annual convention of the Association of American Agricultural Colleges and Experiment Stations and of the fourth annual convention of the Land-Grant College Engineering Association, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Colls and Expt. Stas. and Land-Grant Coll. Engin. Assoc.*, 1915, pp. 304).—This is a detailed account of the proceedings, including the papers submitted, of these two conventions held at Berkeley, Cal., August 11-13, 1915 (E. S. R., 33, p. 301).

The proceedings of the convention of the Association of American Agricultural Colleges and Experiment Stations include the Report of the Bibliographer, A. C. True, submitting a list of documents that record the history of agricultural extension legislation, together with a brief summary of the chief factors in bringing it about (pp. 32-44); report of the committee on instruction in agriculture on College Courses for the Preparation of Extension Workers (pp. 45-70); report of the committee on college organization and policy including a discussion of the forms of organization in various land-grant agricultural institutions, tentative outlines of a plan for study of college organization and policy, and a bibliography of college organization and administration (pp. 104-123); report of the committee on experiment station organization and policy dealing with the functions of the stations in relation to various forms of regulatory activity (pp. 123-125); report of the committee on extension organization and policy offering suggestions toward standardization of methods of administration (pp. 125-129); and the following addresses:

Address of Welcome, B. I. Wheeler (pp. 19, 20); The Presidential Address, on A National System of Education, E. A. Bryan (pp. 72-82); An Account of the Methods of Work of the Agricultural Institutions in California, T. F. Hunt (pp. 83-90); The Exhibit in Agricultural Education at the Panama-Pacific International Exposition, A. C. True (pp. 91-94); Economic Science in Agricultural and Mechanical Colleges, C. A. Duniway (pp. 94-96); The Preparation of Teachers as Contemplated in the Nelson Amendment, A. R. Hill (pp. 96-100); Exchange of Instructors in Agricultural College Work, H. L. Russell (pp. 102-104); The Correlation of the College of Agriculture with the Other Colleges of the State, A. Vivian (pp. 130-134); The Place of Mechanic Arts in Land-grant Institutions, R. A. Pearson (pp. 135-140); The Relation of the Bureau of Education to the Agricultural Colleges, S. P. Capen (pp. 140-146); Federal Aid to Engineering Experiment Stations, F. G. Newlands (pp. 146-150); The Preparation Required for the College Teacher in Agriculture, R. A. Pearson (pp. 150-159); The Preparation Required for Research Work in Agriculture, T. F. Hunt (pp. 159-161); The Preparation Required for Extension Work in Agriculture, A. C. True (pp. 161-165); The Administration of Engineering Divisions of Land-grant Colleges, H. J. Waters (pp. 168-171); Duplication in Engineering Between Land-grant Institutions and State Universities, A. Marston (pp. 171-177); The Annual Report, R. H. Forbes (pp. 179-182); Bulletins, R. G. Knight (pp. 182-185); The Publication of the Results of Investigations Made in Experiment Stations in Technical Scientific Journals, Including the Journal of Agricultural Research, R. Pearl (pp. 186-191) previously noted (E. S. R., 33, p. 401); Effective Correlation of Station and Extension Workers,

viewed from the standpoint of the extension director, Bradford Knapp (pp. 189-200); The Effective Correlation of Station and Extension Workers from the Standpoint of Station Work, C. E. Thorne (pp. 200-202); The Best Means of Securing Proper Recognition and Credit for Station Work in Extension Work, H. L. Russell (pp. 202, 203); What Can the Stations do to Encourage More Men to Fit Themselves for Advanced Research? C. D. Woods (p. 206); The Place Which Demonstration Should Have in Extension Work, Bradford Knapp (pp. 209-213); County Organization of Extension Work in Agriculture and Home Economics, C. A. Keffer (pp. 214-219); The Organization of Cooperative Extension Work, Machinery and Method (In the State), B. T. Galloway (pp. 220-224); The Organization of Cooperative Extension Work, Machinery and Method (In the Federal Department of Agriculture), A. C. True (pp. 228-231); Shall Extension Service Include the Social, Recreational and Educational Improvement of Rural and Urban Districts? W. D. Durd (pp. 232-241); Organization and Methods of Home Economics Extension, Mrs. H. W. Calvin (pp. 241-246); and Home Demonstrations, Miss Mary E. Creswell (pp. 247-252).

The proceedings of the convention of the Land-Grant College Engineering Association include the report of a special committee on fees for professional (engineering) services in land-grant colleges (pp. 256-265); report of the committee on extension texts (pp. 271-274); and the following addresses: Presidential Address, H. W. Tyler (pp. 277, 288); Adaptation of Engineering Education to Local Needs, A. W. Richter (pp. 274-277); Correlation of Courses of Study in Engineering, G. A. Covell (pp. 277-281); Bill for the Establishment of Mechanic Arts Experiment Stations, O. L. Waller (p. 281); The Adaptation of Engineering Experiment Stations to Local Needs, F. E. Turnoore (pp. 281-283); The Relation of the Engineering Experiment Station to the Colleges of Engineering, C. S. Nichols (pp. 284, 285); and Lessons to be Drawn from the Experience of the Agricultural Experiment Stations, O. V. P. Stout (pp. 286-294).

The progress of productive pedagogy, S. G. RUBINOW (*School and Society*, 2 (1915), No. 51, pp. 879-884).—The author gives an account of the progress of agricultural instruction, beginning with the organization of agricultural societies in 1785.

The home project as the center v. the home project as the outgrowth of agricultural instruction, C. G. SMYTH (*School Ed.*, 35 (1916), No. 6, pp. 4, 5).—The author holds that home project work may more profitably be organized as an outgrowth than as the center of agricultural instruction. Students electing agriculture should have a complete course as organized for their community, embracing definite class, laboratory, and home work. It is a waste of time and effort to treat each individual separately through his separate and distinct project in home work, as the most important general principles, which are of importance to all, can better be taught in the regular classes. Further while the requirement of some home project will increase the student's grasp of all phases of instruction involved in it, it is impossible to embody all principles in any such project, and it must necessarily be considered somewhat accidental in the course. Hence home project work should not be substituted for class work, but should be organized into a closer relationship with theory and practice. The author considers the productive home project, excepting perhaps a garden or poultry project, of no interest to 80 per cent of the boys in Minnesota high-school classes in agriculture. Out of 104 of these schools reporting 66 report some form of home project work, and 15 will require such work this year.

Problems in farm woodwork, S. A. BLACKBURN (*Peoria, Ill.: The Manual Arts Press, 1915, pp. 129, fig. 60*).—This book aims to present the forms, dimensions

shops, and other construction data for objects that can be correlated with work in agriculture in agricultural, high, industrial, and country schools. It includes problems dealing with the shop, poultry raising, seed-corn storage, the yard, house, and garden, stock raising, the barnyard, beekeeping, concrete forms, etc.

Ohio Agricultural Day (*Columbus, Ohio: Bd. Agr., 1915, pp. 31, figs. 5*).—This manual contains program material and suggestions for the observation of Agricultural Day in Ohio, on November 12, 1915, by the schools, churches, ranges, chambers of commerce, and other organizations.

MISCELLANEOUS.

Annual report of the director of the experiment station on work done under the local experiment law in 1915, J. F. DUGGIE (*Alabama Col. Sta. Bul. 34 (1916), pp. 31*).—This includes a report by the director on the progress of the work under this law (E. S. R., 24, p. 400), a financial statement for the year, and reports from heads of departments, including detailed reports of boys' and girls' club work.

Abstracts of papers not included in bulletins. finances, meteorology, index (*Veine Sta. Bul. 245 (1915), pp. 289-334+XVI, fig. 1*).—This contains the organization list of the station; abstracts of 14 papers published elsewhere and previously noted, and an abstract of the paper noted on page 279 of this issue; meteorological observations noted on page 203; a financial statement for the fiscal year ended June 30, 1915; an index to Bulletins 225 to 245, inclusive, which collectively constitute the thirty-first annual report of the station; an index to the reports from 1911 to 1915; and announcements as to the work, research, publications, and equipment of the station.

Fourth and Fifth Annual Reports of the Dickinson, North Dakota, Substation, 1911 and 1912 (*North Dakota Sta. Rpts. Dickinson Substa., 1911, pp. 1-1912, pp. 17*).—These reports contain the organization list and an administrative report on the work of the substation during the years 1911 and 1912, respectively, including meteorological data noted on page 206 of this issue.

Sixth Annual Report of the Dickinson, North Dakota, Substation, 1913 (*North Dakota Sta., Rpt. Dickinson Substa., 1913, pp. 40, figs. 11*).—This contains the organization list and a report on the work of the substation during 1913. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the Hood River, Oregon, Branch Experiment Station, 1913-14 (*Oregon Sta., Bicn. Rpt. Hood River Sta., 1913-14, pp. 50, fig. 1*).—This contains reports of the director of the Oregon Station and heads of departments on the work of this substation, the experimental features of which are for the most part abstracted elsewhere in this issue, and an article on The Farm Vegetable Garden noted on page 234.

Report of the Umatilla, Oregon, Branch Experiment Station, 1914, R. W. BATES (*Oregon Sta., Rpt. Umatilla Sta., 1914, pp. 11, figs. 2*).—This contains a description of the substation, its resources and purposes, soil, climatic, and other conditions, and types of experimental work, and discusses the value of the substation. See also a previous note (E. S. R., 30, p. 441).

Twenty-eighth Annual Report of Rhode Island Station, 1915 (*Bul. R. I. State Col., 11 (1916), No. 4, pp. 23-29, 37-39*).—These pages include a report of the director and a financial statement for the fiscal year ended December 31, 1915. The experimental work reported with field crops is abstracted on page 225 of this issue.

Index to Farmers' Bulletins Nos. 1-500, prepared by C. H. GREATHOUSE (*U. S. Dept. Agr., Index Farmers' Buls. 1-500, pp. 432*).

NOTES.

Connecticut State Station.—G. L. Davis, assistant chemist since 1913, terminated his work at this station in June.

Iowa College.—George W. Iversou, instructor in agricultural engineering, has resigned to become farm-engineering editor of a chain of agricultural publications.

Kansas College and Station.—The honorary degree of LL. D. was bestowed upon President H. J. Waters by the University of Missouri at its recent commencement.

Dr. C. M. Brink, professor of English literature and dean emeritus of the college, died June 29. He had been with the institution since 1902 and served as dean of the college from 1909 until his recent retirement.

W. A. Lippincott, poultry husbandman, has been given a year's leave of absence for graduate work in genetics at the University of Wisconsin.

In the extension division, Miss Minnie Sequist has been appointed specialist in home economics and Miss Mary Wright specialist in domestic arts, both appointments beginning September 1. R. P. Schnacke and F. B. Williams have been appointed county agents for Pawnee and Marshall counties, respectively, and have entered upon their duties. Including the 16 county agents and 5 district agents at work in the State, there are now 42 men and 6 women devoting full time to the extension work of the college. A conference of the members of the division of extension, policies, and relationship between county and district agents, extension specialists, and specialists of the division of agriculture.

Minnesota University and Station.—Dr. R. A. Gortner, associate professor of soil chemistry, has been transferred to the division of agricultural biochemistry with the title of associate professor of agricultural biochemistry and in charge of the section of biochemical research.

Missouri Station.—Henry Cohn has succeeded C. E. Deardorff, resigned, as assistant in the soil survey. A. F. Ridgway has been appointed assistant in veterinary science.

Nebraska University and Station.—Dr. Raymond J. Pool has been appointed permanent head of the department of botany. C. A. Helm, instructor and assistant in experimental agronomy, has resigned to become assistant professor of agronomy in the University of Missouri. William Rahak has been appointed instructor in agricultural chemistry and assistant in agricultural chemistry in the station.

New Jersey Stations.—Samuel U. Hoddeson and Joseph J. Williams have resigned as assistant chemists. Louis J. Kleinfeld and D. James Kay have been appointed assistant chemists; H. C. Haines, assistant extension specialist in fruit growing; Miss E. P. Leeds, assistant State leader of girl's club work and David Schmidt, field assistant in horticulture.

